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Influence of varieties, organic manures and inorganic fertilizers on growth, yield and quality of okra (*Abelmoschus esculentus* L.)

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Abstract

A field investigation was carried out during *Rabi* season, 2016-17 at Vegetable Research Field, College of Horticulture, Mandsaur, Madhya Pradesh. The experiment was comprised of two varieties (Kashi Pragati and Kashi Kranti) and seven nutrient levels with different sources of nutrients including organic fertilizers, inorganic fertilizers. Variety V_1 (Kashi Pragati) exhibited maximum plant height, number of leaves per plant, number of branches per plant, internodal length, SPAD value, fresh weight and dry weight of plant, earliest days to 50% flowering and days to first picking. Similarly, maximum number of fruits per plant, fruit length, fruit diameter, fruit weight, fruit yield per plant and fruit yield per hectare in variety Kashi Pragati. Quality parameters i. e. protein content (%) and fibre content (%) in fruit were also found maximum in case of variety Kashi Pragati. Among the nutrient levels, application of 50 % NPK + 50 % N through vermicompost (62.5:40:40 NPK + 4.1 t/ha) showed highest growth, yield, quality parameters and yield of okra. The gross income, net income and benefit: cost ratio was found to be superior with variety Kashi Pragati and nutrient level 50 % NPK + 50 % N through vermicompost(62.5:40:40 NPK + 4.1 t/ha).

Key words: Organic manures, Vermicompost, Okra, FYM, Quality, Yield

Introduction

Okra (*Abelmoschus esculentus* L.) commonly known as Bhindi or lady's finger belongs to family Malvaceae. It is an annual vegetable crop in tropical and subtropical parts of the world. It is one of the most important nutritious vegetable crops grown round the year in India. Okra is an important fruit vegetable of high commercial and food values. It is primarily valued for its tender, immature green pods in fresh form; however, its curry, soups and edible young leaves are also popular. To a limited extent, it finds use in canned, dehydrated or frozen forms for off-season consumption by the army at high altitudes and export (Sharma et al. 2015). India is a largest producer of okra in the world with an annual production of 6094.94 thousand MT from an area of 509.02 thousand hectare (5.7 % of total vegetable area). The major okra growing states of India are Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh, Karnataka and Assam. (Anonymous 2018). Among the various factors affecting successful cultivation of okra, the judicious use of nutrients is one of those. Nitrogen is an essential element and important determinant in growth and development of crop plants. It plays an important role in chlorophyll, protein, nucleic acid, hormone and vitamin synthesis and also helps in cell division, cell elongation. Phosphorus fertilization can influence fruiting and development of okra. Phosphorus is called the "key to life" because it is directly involved in most living processes (Firoz 2009). The requirements of fertilizers in okra are important for the early growth and total yield of fruit. Integrated use of organic and inorganic fertilizers can improve crop productivity. The soil enriched with vermicompost provides additional substances that are not found in chemical fertilizers (Mal et al. 2013).

Use of organic manures to meet the nutrient requirement of crop would be an inevitable practice in the years to come for sustainable agriculture since, organic manures generally improve the soil physical, chemical and biological properties along with conserving the moisture holding capacity of soil and thus resulting in enhanced crop productivity along with maintaining the quality of crop produce although the organic manures contain plant nutrients in small quantities as compared to the fertilizers, the presence of growth promoting principles like enzymes and hormones, besides plant nutrients make them essential for improvement of soil fertility and productivity (Premsekhar and Rajshree 2009). In organic agriculture, N is usually the limiting nutrient because its availability in the soil depends on organic matter

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mineralisation and it is required by crops in large amounts (Pinto et al. 2017). Being a short duration crop, its growth and yield parameters are largely influenced by appropriate nutrient management practice. Sole application of chemical fertilizers to meet the crop nutrient demand is deleterious for both soil and environment (Thirunavukkrasu and Balaji 2015). Hence, organic manure from different sources could be an effective substitute of chemical fertilizer which improves the crop yield and soil properties (physical and chemical). It has also been proved that organic sources contribute a lot in organic matter percentage in the soil. Keeping in view the above facts and need of optimum use of organic manures and inorganic fertilizers, an experiment was conducted to study the effect of varieties, organic manures and inorganic fertilizers on growth, yield and quality of okra.

Materials and Methods

Field experiment was conducted during *Kharif* season of 2016-17 at Research Field of the Department of Vegetable Science, College of Horticulture, Mandsaur, Madhya Pradesh. Mandsaur is situated in Malwa plateau in western part of Madhya Pradesh at north between latitude of $23^0$45' to $24^0$13' north and longitude of $74^0$44' to $75^0$18' East at an altitude of 435.20 m above mean sea level. The topography of the experimental field is plain. The soil of the experimental field was light alluvial having sandy loam texture with uniform topography. The treatments consisted of two varieties (Kashi Pragati and Kashi Kranti) and seven nutrient levels (N_1- RDF 125:80:80 kg/ha NPK, N_2-100 % N through FYM, N_3-100 % N through Vermicompost, N_4-75 % NPK + 25 % N through FYM, N_5-75 % NPK + 25 % N through Vermicompost, N_6-50 % NPK +50 % N through FYM and N_7-50 % NPK + 50 % N through Vermicompost). The experiment was laid out in a factorial randomized block design with fourteen treatment combinations each replicated three times. The calculated quantities of fertilizers were applied to the respective plot. The sources of nutrient were nitrogen (Urea), phosphorus (SSP) and potash (MOP). Half dose of nitrogen and full dose of phosphorus and potash were applied as basal dose prior to sowing of okra seeds. While the rest dose of nitrogen was given in okra, at 30 days after sowing. Organic manure Viz. FYM and vermicompost were incorporated as per treatment to respective plots prior to sowing on the basis of nitrogen percentage. Seed was sown in lines at a spacing of 45 × 30 cm and at a depth of 2 cm. The gap filling was carried out after 10 days to maintain 30 plants in each plot. Optimum soil moisture was maintained in the field by the protective irrigation 5 times during crop period. The soil samples were collected before and after the experimentation and analyzed. The five plants were selected randomly from each plot and tagged. The observations on growth parameters *viz.* plant height (cm), number of leaves per plant, number of branches per plant, length of Internodes (cm), SPAD value, fresh weight of plant (g) and dry weight of plant (g), days to first picking), days to 50 % flowering were rerecorded during the experiment. The yield attributes i. e. number of fruits per plant, Fruit length (cm), fruit diameter (mm), fruit weight (g), fruit yield/plant (g) and fruits yield (q/ha). The quality parameters, viz. protein content (%) and fibre content (%) were determined using standard procedure. The economics was calculated based on prevailing market prices of different inputs and outputs.

Results and Discussion

Growth parameters: All growth parameters i.e. plant height, number of leaves per plant, number of branches per plant, internodal length, SPAD value, fresh weight of plant, dry weight of plant, days to first picking, days to 50 % flowering were significantly influenced by varieties and nutrient levels (Table 1 and 2). There was increase in plant height with advancement of growth period (Table 1). The results showed that increase in plant height between 30 to 60 DAS was rapid as compared to final harvesting stage. Variety V_1 (Kashi Pragati) recorded maximum plant height at all the stages of growth. Minimum plant height at all the growth stages was recorded in variety V_2 (Kashi Kranti). Khan et al. (2002) also reported significant influence of varieties on plant height. Nutrient level N_7 (50% NPK + 50% N through vermicompost) has registered maximum plant height at all the growth stages. It was followed by N_6, while minimum plant height was observed in case of nutrient level N_2 (100 % N through FYM). It might be due to higher amount of nitrogen, having greater availability of salt like nitrate, phosphate and potash which significantly increase the plant height (Kumar et al. 2013). Observations regarding plant height were in close conformity with the Das et al. (2014) and Singh et al. (2015).

Maximum number of leaves and number of branches per plant was observed in variety V_1 (Kashi Pragati) at all the growth stages. Minimum number of leaves and number of branches per plant was observed in variety V_2 (Kashi Kranti). These findings are in line with findings of Singh et al. (2014). Nutrient levels had exhibited significant effect on number of leaves and number of branches per plant. Highest number of leaves and number of branches per plant were reported under nutrient level N_7 (50% NPK + 50% N through vermicompost) followed by N_6. Lower number of leaves

Table 1: Effect of varieties, organic manures and inorganic fertilizers on growth of okra

Treatment	Plant height (cm)			Number of leaves/plant			Number of branches/plant		Internodal length (cm)		
	30 DAS	60 DAS	At harvesting	30 DAS	60 DAS	At harvesting	60 DAS	At harvesting	30 DAS	60 DAS	At harvesting
Varieties (V)											
V_1 (Kashi Pragati)	26.37	54.30	80.69	8.26	11.65	16.34	2.92	5.30	2.88	4.65	7.89
V_2 (Kashi Kranti)	24.40	51.75	72.91	7.21	10.77	14.40	2.24	4.05	2.63	4.28	6.67
S.Em±	0.47	0.61	0.87	0.17	0.20	0.20	0.06	0.11	0.05	0.09	0.12
CD at 5%	1.36	1.77	2.54	0.52	0.60	0.59	0.16	0.32	0.17	0.28	0.37
Nutrient levels (N)											
N_1	23.45	50.94	74.66	7.42	10.70	15.06	2.37	4.39	2.50	3.75	7.06
N_2	21.98	48.67	71.38	6.73	10.25	14.15	2.15	4.13	2.27	3.14	6.43
N_3	22.83	49.77	73.43	7.24	10.57	14.86	2.31	4.30	2.44	3.59	6.85
N_4	24.75	51.63	77.30	7.59	11.03	15.21	2.46	4.49	2.57	3.95	7.27
N_5	27.13	53.64	77.90	7.87	11.33	15.38	2.67	4.55	2.64	4.60	7.36
N_6	27.36	56.58	79.85	8.05	11.50	15.86	2.77	4.72	2.99	4.43	7.61
N_7	30.19	59.92	83.05	9.20	13.07	17.01	3.27	6.12	3.85	6.75	8.34
S.Em±	0.88	1.14	1.64	**0.33**	**0.38**	**0.38**	0.10	0.21	0.11	0.18	0.24
CD at 5%	2.55	3.32	4.77	**0.97**	**1.13**	**1.11**	0.30	0.61	0.32	0.52	0.70

and number of branches per plant were reported under nutrient level N_2 (100 % N through FYM). The reason for increase number of leaves and number of branches per plant could be attributed to the solubilisation effect of plant nutrients by addition of vermicompost leading to increased uptake of NPK (Singh et al. 2015). Similar findings have been reported by Yadav et al. (2006), Prasad and Naik (2013) and Sharma et al. (2015).

Effect of varieties and nutrient levels was found significant on internodal length in okra. Maximum internodal length (cm) were observed by variety V_1 (Kashi Pragati) followed by variety V_2 (Kashi Kranti) at all the stages of growth. These results are in close conformity with the findings of Singh et al. (2014). The maximum internodal length (cm) was reported under nutrient level N_7 (50% NPK + 50% N through vermicompost) followed by N_6. Minimum internodal length was reported in nutrient level N_2 (100 % N through FYM) The beneficial effect of application of organic manures along with inorganic fertilizers reflected in enhanced vegetative growth of plant. This may be attributed to the synergistic effect of organic manure in making available more plant nutrient by improving the soil physical and chemical condition and solubilising the nutrients. Moreover, the organic manures are also significant sources of major and micronutrients much needed by plants (Tyagi et al. 2016). Similar results have been reported by Das et al. (2014) and Sharma et al. (2015) in okra.

Maximum SPAD value was found with variety V_1 (Kashi Pragati) as compared to variety V_2 (Kashi Kranti) at all the growth stages i.e. 30, 60 DAS and final harvesting stage in okra. Application of nutrient levels showed significant influence on SPAD value of plant at all the growth stages. Nutrient level N_7 (50% NPK + 50% N through vermicompost) recorded maximum SPAD value of plant followed by N_6 at all the growth stages. Application of N_2 (100 % N through FYM) nutrient level found minimum SPAD value of plant. The higher availability of nutrients might have increased chlorophyll content there by higher SPAD value under these treatments (Meena et al. 2017; Mishra et al. 2014).

Table 2: Effect of varieties, organic manures and inorganic fertilizers on growth of okra

Treatment	SPAD value			Fresh weight of plant (g)		Dry weight of plant (g)		Days to first picking	Days to 50 % flowering
	30 DAS	60 DAS	At harvesting	30 DAS	At harvesting	30 DAS	At harvesting		
Varieties (V)									
V_1 (Kashi Pragati)	54.05	58.34	63.66	40.78	164.85	9.22	40.81	41.23	37.39
V_2 (Kashi Kranti)	52.58	56.94	60.14	38.39	146.49	8.24	36.94	44.16	40.65
S.Em±	0.50	0.45	0.46	0.54	1.43	0.16	0.51	0.46	0.52
CD at 5%	1.47	1.33	1.34	1.59	4.17	0.47	1.49	1.34	1.53
Nutrient levels (N)									
N_1	52.25	56.96	60.90	39.17	147.08	8.31	36.79	43.64	39.58
N_2	51.44	55.50	58.32	33.26	133.77	7.33	33.08	44.94	41.14
N_3	52.08	56.38	59.39	30.01	140.08	7.99	34.66	44.17	40.16
N_4	53.03	57.42	60.93	40.30	155.28	8.57	38.75	43.05	39.28
N_5	53.41	57.92	63.19	41.84	163.74	8.97	39.94	41.98	38.78
N_6	54.11	58.29	63.60	41.50	171.51	9.10	42.82	41.07	37.82
N_7	56.88	60.98	66.92	44.98	178.20	10.83	46.04	40.02	36.39
S.Em±	0.94	0.85	0.86	1.02	2.68	0.30	0.96	0.86	0.98
CD at 5%	2.75	2.49	2.51	2.97	7.81	0.89	2.80	2.51	2.86

Average fresh and dry weight of plant was significantly affected with varieties and nutrient levels. Maximum fresh and dry weight of plant was recorded in variety V_1 (Kashi Pragati) at all the growth stages as compared to variety V_2 (Kashi Kranti). Maximum fresh and dry weight of plant was observed with nutrient level N_7 (50% NPK + 50% N through vermicompost) followed by N_6, N_5, N_4, N_1 and N_3 in descending order. Minimum fresh and dry weight of plant was found in nutrient level N_2 (100 % N through FYM) at all the stages of crop growth. Organic manures have good amount of micronutrients might improve physical & chemical properties of soil. Therefore, more biomass was produced by the plants which resulted in the sustainable healthy plant system consequently increased fresh and dry weight of plant (Kumar et al. 2013).

Results indicated significant effect of varieties on days to first picking. Earliest first picking was commenced in variety V_1 (Kashi Pragati) followed by V_2 (Kashi Kranti). The findings are in close conformity with those reported by Singh et al. (2014). There was significant effect of nutrient levels on days to first picking. Application of nutrient levels caused significant influence on days to first picking. Maximum days to first picking were taken under nutrient level N_2 (100 % N through FYM). Minimum days to first picking were noted under nutrient level N_7 (50% NPK + 50% N through vermicompost). Findings revealed that significant effect of varieties and nutrient levels on days to 50 % flowering in okra. Earliest 50 % flowering was commenced in variety V_1 (Kashi Pragati) it was followed by V_2 (Kashi Kranti). These results are in line with Jamala et al. (2011) and Singh et al. (2014) in okra. Application of nutrient levels caused significant influence on days to 50 % flowering. Maximum days to 50 % flowering were taken with application of N_2 (100 % N through FYM) nutrient level which was significantly higher over other nutrient levels while earliest 50 % flowering was recorded with nutrient level N_7 (50% NPK + 50% N through vermicompost). Early flowering may be due to interaction effect as vermicompost have soil microbes, nitrogen fixing bacteria, phosphate solubilising bacteria and growth hormone auxin, gibberellins and cytokines which influence and enhance efficiency of nitrogen greater than that of chemical fertilizer which influence early flowering (Das et al. 2014). Earliness in day to flowering in okra was observed with integrated nutrient application by Mal et al. (2013) and Tyagi et al. (2016) in okra.

Yield attributes: Yield attributes viz. number of fruits per plant, fruit length (cm), fruit diameter (mm), fruit weight (g), fruit yield per plant (g) and fruit yield per hectare (q) showed significant influence of varieties and nutrient levels (Table 3). Variety V_1 (Kashi Pragati) recorded maximum number of fruits per plant. Minimum number of fruits per plant observed by variety V_2 (Kashi Kranti). These findings are in resemblances with the results obtained by Khan et al. (2002) and Jamala et al. (2011). Nutrient levels exhibited significant effect on number of fruits per plant in okra. Maximum number of fruits per plant was found with application of nutrient level N_7 (50% NPK + 50% N through vermicompost). Minimum number of fruits per plant was observed with application of nutrient level N_2 (100 % N through FYM). Similar findings of significantly higher number of fruits/ plant by the use of organic manure & inorganic fertilizers

Table 3: Effect of varieties, organic manures and inorganic fertilizers on yield, quality and profitability of okra

Treatment	Number of fruits per plant	Fruit length (cm)	Fruit diameter (mm)	Fruit weight (g)	Fruit yield per plant (g)	Fruit yield (q/ha)	Protein content (%) in fruit*	Fibre content (%) in fruit	Gross income (Rs./ha)	Net income (Rs./ha)	B:C ratio
Varieties (V)											
V_1 (Kashi Pragati)	16.09	12.85	15.61	11.67	189.17	140.11	12.84	10.43	140122.43	95037.57	2.18
V_2 (Kashi Kranti)	13.47	9.68	14.68	10.92	149.22	110.53	12.59	10.67	110534.27	65449.41	1.53
S.Em±	0.21	0.20	0.22	0.22	4.22	3.12	0.06	0.06	3129.11	3129.11	0.07
CD at 5%	0.62	0.58	0.65	0.64	12.27	9.09	0.17	0.18	9096.19	9096.19	0.21
Nutrient levels (N)											
N_1	13.47	11.01	14.45	10.85	146.77	108.72	12.28	10.92	108724.63	72789.63	2.03
N_2	12.28	9.71	13.11	10.05	124.78	92.43	12.04	11.66	92434.91	38199.91	0.70
N_3	12.86	10.49	13.53	10.64	137.08	101.54	12.17	11.29	101548.81	47314.81	0.87
N_4	14.52	11.31	15.05	11.27	163.83	121.36	12.34	10.63	121363.40	80853.40	2.00
N_5	15.45	11.51	15.37	11.51	178.87	132.50	12.47	10.49	132505.02	91995.02	2.27
N_6	16.62	11.69	16.39	11.67	194.59	144.14	13.47	9.51	144146.74	99061.74	2.20
N_7	18.21	13.10	18.10	13.05	238.37	176.57	14.25	9.34	176574.93	131489.93	2.92
S.Em±	0.40	0.37	0.42	0.41	7.90	5.85	0.12	0.11	5854.03	5854.03	0.14
CD at 5%	1.17	1.09	1.23	1.21	22.97	17.01	0.33	0.34	17017.42	17017.42	0.40

*dry weight basis

have also been reported by Prasad and Naik (2013), Singh et al. (2015) and Tyagi et al. (2016) in okra. Maximum fruit length and fruit diameter (mm) were observed with variety V_1 (Kashi Pragati). Minimum fruit length and diameter per plant observed with variety V_2 (Kashi Kranti). Similar findings have been reported by Jamala et al. (2011) and Singh et al. (2014) in okra. Application of nutrient levels caused significant influence on fruit length and fruit diameter and fruit weight. Maximum fruit length and fruit diameter was found with application of nutrient level N_7 (50% NPK + 50% N through vermicompost) followed by N_6. Minimum fruit length and fruit diameter was observed with application of nutrient level N_2. This might be due to combined application of organic manures and inorganic fertilizers which might have acted complementary and supplementary to each other and resulted into adequate slow but steady supply of nutrients (Bairwa et al. 2009). The availability of nutrients at the critical stages of the crop growth resulted early establishment, vigorous growth and development of plants leading to longer and wider fruits (Mal et al. 2013). High value in fruit length and fruit diameter was observed due to integrated nutrients application by Kumar et al. (2013) in okra.

Maximum fruit weight (g) was commenced in variety V_1 (Kashi pragati) it was followed by V_2 (Kashi Kranti). Such variability in fruit weight in okra is also conformity with the earlier findings reported by Khan et al. (2002), Jamala et al. (2011), Singh et al. (2013), Mal et al. (2014) and Singh et al. (2014). Application of nutrient levels caused significant influence on fruit weight (g). Maximum fruit weight (g) were taken with application of N_7 (50% NPK + 50% N through vermicompost) nutrient level which was significantly higher over other nutrient levels. Similar findings have been reported by Yadav et al. (2006), Bairwa et al. (2009) and Singh et al. (2015) in okra.

Variety V_1 (Kashi Pragati) was recorded maximum fruit yield per plant (g) and fruit yield per hectare (q). Minimum fruit yield per plant (g) and fruit yield per hectare was observed with variety V_2 (Kashi Kranti). These results are in close conformity with the findings of Khan et al. (2002), Jamala et al. (2011), Singh et al. (2013), Mal et al. (2014) and Singh et al. (2014). Nutrient levels exerted significant influence on fruit yield per plant (g) and fruit yield per hectare (q). Highest fruit yield per plant (g) and fruit yield per hectare (q) were taken under the nutrient level N_7 (50% NPK + 50% N through vermicompost) followed by N_6. Minimum fruit yield per plant (g) and fruit yield per hectare (q) were observed in case of nutrient level N_2 (100 % N through FYM). The high yield was due to enhanced shoot growth of the plant, increased number of nodes, branches and number of fruits per plant (Yadav et al. 2006). Similar results were reported earlier by Bairwa et al. (2009), Prasad and Naik (2013), Das et al. (2014) and Tyagi et al. (2016) in okra.

Quality attributes: Maximum protein (%) in fruit was found in variety V_1 (Kashi Pragati). Lowest protein (%) in fruit was noted in case of variety V_2 (Kashi Kranti). Nutrient levels exerted significant influence on protein (%). Maximum protein (%) in fruit was observed with application of nutrient level N_7 (50 % NPK + 50 % N through vermicompost). It was significantly higher than all other nutrient levels, while minimum protein (%) content in fruit was recorded under nutrient level N_2 (100 % N through FYM). The increase in protein content was pronounced with the higher level of organic form applied in combination of inorganic form, favoured by intense protein synthesis and its efficient storage in presence of abundant supply of available nitrogen protein content was increased significantly by the application of different organic manures with fertilizers (Gayathri and Krishnaveni 2015). Highest protein content in treatment receiving conjunction of organic manure and inorganic fertilizer was found by Yadav et al. (2006), Wagh et al. (2014) and Thakur et al. (2018). Results indicated significant effect of varieties on fibre content (%) in pod. Maximum fibre content (%) in fruit was noted in variety V_2 (Kashi Kranti) followed by V_1 (Kashi Pragati). There was significant effect of nutrient levels on fibre content (%). Application of nutrient levels caused significant influence on fibre content (%). Maximum fibre content (%) was taken under nutrient level N_2 (100 % N through FYM). Minimum fibre content (%) was noted under nutrient level N_7 (50% NPK + 50% N through vermicompost). Application of organic form of nitrogen in combination with inorganic form reduced the crude fibre content. This might be due to easy availability of nitrogen leading to balanced C:N ratio, enhancing the vegetative growth resulting in high photosynthesis activity (Wagh et al. 2014). Similar findings have also been reported by Premsekher and Rajshree (2009).

Economics of fruit production: Variety V_1 (Kashi Pragati) recorded maximum gross return (Rs./ha), net income (Rs./ha) and B:C ratio. Minimum gross return, net income and B:C ratio was recorded with V_2 (Kashi Kranti). Among the nutrient level N_7 (50% NPK + 50% N through vermicompost) was found highest gross return (Rs./ha), net return (Rs./ha) and B:C ratio. It was followed by N_6, N_5, N_4, N_1 and N_3. While lowest gross income, net income and B:C ratio were found with application of nutrient level N_2 (100 % N through FYM). Similar findings have been reported by Das et al. (2014), Mal et al. (2014), Tyagi et al. (2016) and Kushwah et al. (2019).

Conclusion

Based on experiment, it may be concluded that variety V_1 (Kashi Pragati) recorded superior performance for growth attributes, yield attributes, quality attributes, gross income, net income and B:C ratio. Among the nutrient levels N_7 (50% NPK + 50% N through vermicompost) resulted in the highest growth attributes, yield attributes, quality attributes, gross income, net income and B:C ratio of okra. Though combined effect of varieties and nutrient levels was non-significant with all the characters. However, numerically treatment combination V_1N_7 showed superior performance for growth attributes, yield attributes, quality attributes, gross income, net income and B:C ratio.

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प्रयोग के आधार पर, यह निष्कर्ष निकाला जा सकता है कि भिण्डी की किस्म काशी प्रगति ने बढ़वार विशेषताओं, उपज विशेषताओं, गुणवत्ता विशेषताओं, सकल आय, शुद्ध आय और लगतःलाभ अनुपात के लिए बेहतर प्रदर्शन किया। पोषक तत्वों के स्तर में वर्मीकम्पोस्ट के माध्यम से 50 प्रतिशत नत्रजन तथा 50 प्रतिशत उर्वरक की अनुशंसित मात्रा के परिणामस्वरूप उच्चतम वृद्धि विशेषताएँ, उपज विशेषताएँ, गुणवत्ता विशेषताएँ, सकल आय, शुद्ध आय और भिण्डी का लागत अनुपात बेहतर रहा है। हालांकि सभी लक्षणों के साथ किस्मों और पोषक तत्वों के स्तर का संयुक्त प्रभाव गैर महत्वपूर्ण था हालांकि, संख्यात्मक रूप से उपचार संयोजन वी$_1$एन$_7$ ने विकास विशेषताओं, उपज विशेषताओं, गुणवत्ता विशेषताओं, सकल आय, शुद्ध आय और लगतःलाभ अनुपात के लिए बेहतर प्रदर्शन दिखाया।

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