Biological Forum – An International Journal **14(2): 624-629(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Growth Parameters of Capsicum (*Capsicum annuum* var. *grossum* L.) as Influenced by Different Nitrogen and Potassium Fertigation Levels under Poly House

B. Gouthami*, M. Uma Devi M., K. Avil Kumar and V. Ramulu
Water Technology Centre, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad (Telangana), India.

(Corresponding author: B. Gouthami)*
(Received 05 February 2022, Accepted 21 April, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: A field investigation was conducted at Water Technology Centre, College of Agriculture, during 2018-19 *rabi* season, Rajendranagar, Hyderabad. The experiment consisted of three replications in a Factorial Randomized Block Design (FRBD) with two factors, namely N levels (4) and K levels (3), and twelve treatments, namely N fertigation levels of 0 percent, 120 percent (216 kg N ha^{-1}), 150 percent (270 kg N ha^{-1}), 180 percent (324 kg N ha^{-1}), and K fertigation levels of 0 percent, 80 percent (96 kg K_2O ha^{-1}), and 100 percent (120 kg K_2O ha^{-1}), The RDF was 180, 90, and 120 kg N, P_2O_5, and K_2O ha^{-1}, respectively. The soil texture at the experimental location was sandy loam, with low available nitrogen (166.5 kg ha^{-1}), medium available phosphorus (81.1 kg P_2O_5 ha^{-1}), and low in available potassium (245.4 kg K_2O ha^{-1}) The crop received a total of 414.8 mm of water. Among varied doses of nitrogen, application of 180 % N (324 kg N ha^{-1}) recorded relatively higher plant growth parameters like plant height (97.29 cm), number of branches plant^{-1} (5.76), number of leaves plant^{-1} (57.29), LAI (1.743), SPAD chlorophyll reading (63.42), total dry matter production (1970.22 kg ha^{-1}) followed by 150 % N (270 kg N ha^{-1}). With regard to potassium fertigation, 100% K_2O (120 kg K_2O ha^{-1}) recorded relatively higher plant growth parameters like plant height (96.84 cm), number of branches plant^{-1} (5.67), number of leaves plant^{-1} (56.98), LAI (1.671), SPAD chlorophyll reading (62.79), total dry matter production (1983.83 kg ha^{-1}) followed by 80 % K_2O (96 kg K_2O ha^{-1}). Hence for capsicum crop grown in naturally ventilated poly house during *rabi* season, application of 324 kg N and 120 kg K_2O ha^{-1} by fertigation is recommended.

Keywords: Poly house- capsicum-N and K fertigation schedule - growth parameters.

INTRODUCTION

Capsicum has recently been designated as a high-value crop in India, and it is considered one of the most delicious and pleasant-tasting veggies. Due to its high ascorbic acid content, as well as other vitamins and quality qualities, it is commonly used in Indian cuisine. (oleoresin, TSS, capsaicin, capsanthin, and other compounds) It can be eaten as a vegetable or as a condiment. India contributes average annual production of 1.08 million tonnes from an area of 1.06 million hectare with a productivity of 1.12 t ha^{-1} Anonymous (2014).

In Telangana it occupies an area of 150.2 ha, with 2873 metric tonnes production (Telangana State Horticulture Mission, 2018-19). Capsicum attained a status of high value low volume crop in India in recent years and occupies a place of pride among vegetables in Indian cuisine, because of its delicacy and pleasant flavour coupled with rich content of ascorbic acid along with other vitamins and minerals (Kurubetta and Patil, 2009). 100 gm of edible portion of capsicum provides 24 Kcal of energy, 1.3 g of protein, 4.3 g of carbohydrate and 0.3 g of fat Anonymous (2006). The plant are grown under controlled or partially controlled environment resulting in higher yields than that is possible under open conditions Navale *et al.* (2003).

MATERIALS AND METHODS

A field experiment was conducted at the Horticultural Farm, College of Agriculture, Rajendranagar, Hyderabad, during the rabi season of 2019-20. The experiment was set up in a Factorial Randomized Block Design with two components (FRBD). { N levels (4), K levels (3) } with twelve treatments Viz; T_1 - Control (No N, K_2O), T_2 - N_0 (No fertilizer) + 80 % RD of K_2O, T_3 - N_0 (No fertilizer) + 100 % RD of K_2O, T_4 -120 % RD of N + K_0 (No fertilizer), T_5 – 120 % RD of N + 80 % RD of K_2O, T_6 – 120 % RD of N + 100 % RD of K_2O, T_7 – 150 % RD of N + K_0 (No fertilizer), T_8 - 150 % RD of N + 80 % RD of K2O, T_9 – 150 % RD of N + 100 % RD of K_2O, T_{10} – 180 % RD of N + K_0 (No fertilizer), T_{11} – 180 % RD of N + 80 % RD of K_2O, T_{12}- 180 % RD of N + 100 % RD of K_2O. {The 100 % (RDF) was 180, 90 and 120 kg N, P_2O_5 and K_2O ha^{-1}}. The crop was also given a common dose of 12.5 t ha^{-1} vermicompost, 1.5 t ha^{-1} neem cake, and 90 kg P2O5 ha, as well as waste decomposer, vermi wash sprays every 15 days. The total amount of water used was 414.8 mm.

Plant height from the base of the main stem to the tip was measured and expressed in cm and number of leaves and branches plant^{-1} were recorded from the five randomly selected plants at 30, 60, 90, 120, 150 DAT and at final harvest. The leaf area index is the ratio of leaf area per plant to land area per plant. Leaf area was estimated on three randomly selected plants in each plot at 30, 60, 90, 120, 150 DAT and at final harvest with LI 3100 leaf area meter (LI-COR, INC. Linocoln, Nebraska, USA). The LAI was computed taking into account the area occupied by each plant according to Watson (1952). The SPAD value correlates with actual chlorophyll content in the leaf. The readings of chlorophyll meter SPAD were taken by using a SPAD 502 meter (Minolta, Japan) at 30, 60, 90, 120, 150 DAT and at final harvest. Three plants used for recording LAI were uprooted carefully at 30, 60, 90, 120, 150 DAT and at final harvest and roots were removed from basal portions. Then the samples were first air dried in shade for one day and then oven dried at 60^0C till a constant weight was obtained. The mean dry weight of plant samples was expressed as g plant^{-1}.

RESULTS AND DISCUSSION

Plant height. Plant height ranged from 21.9 cm to 25.4 cm at 30 DAT, 38.7 cm to 51.0 cm at 60 DAT, 66.5 cm to 82.3 cm at 90 DAT, 89.5 cm to 101.8 cm at 120 DAT, 87.1 cm to 100.3 cm at 150 DAT, 86.3 cm to 99.3 cm at final harvest. It was observed that, with an increase in fertigation levels, there was increase in plant height with every increment in N and K fertigation level. Different doses of nitrogen fertigation had a significant effect on height. N_{180} recorded the highest plant height at all the stages (30, 60, 90, 120, 150 and at final harvest) followed by N_{150} while the lowest was recorded with N_0. By the application of different potassium doses the highest plant height was obtained with K_{100} at all the stages, while the lowest was noticed with K_0.

The plant height in capsicum was greatly influenced by the application of nitrogen, potassium and due to combined effect under poly house conditions. Increase in plant height of capsicum might be due to the higher amount of nutrients availability through drip fertigation and favourable microclimate under the poly house for promotion of carbohydrate metabolism and cell elongation resulting in efficient utilisation, due to the production of more chlorophyll, photosynthates, phytohormone and cytokinin which was utilized by the plant during its growth resulting in quicker cell formation and elongation leading to increase in the height of the plants. Similar findings were reported by Kumar *et al.* (2018). Significantly higher plant height of paprika was recorded with the highest level of N and K *i.e* 125 % N and 125 % K_2O by Mounika (2016). According to Malshe *et al.* (2016), maximum plant height (78.4 cm) was recorded under poly house conditions, Mohanty *et al*. (2001) in chilli and Jan *et al.* (2006) in capsicum

No. of branches plant^{-1}. It was significantly influenced by N and K fertigation levels at 90, 120 DAT and was not significantly influenced at 30, 60, 150 DAT and at final harvest. It ranged from 0.97 to 1.73 at 30 DAT, 2.47 to 3.53 at 60 DAT, 3.87 to 5.37 at 90 DAT, 4.40 to 6.83 at 120 DAT, 4.00 to 5.37 at 150 DAT and 4.09 to 4.91 at final harvest. Among different nitrogen doses N_{180} recorded significantly more number of branches plant^{-1} and the lowest were recorded with N_0. Where as in potassium fertigation significantly the highest number of branches plant^{-1} were observed with K_{100}, while the lowest were recorded with $K_{0.}$

There was increase in branches plant^{-1} this may be due to increase in nutrient use efficiency and synergistic effect of nitrogen and potash, there was increase in number of primary branches. Availability and uptake of nutrient and vigorous growth character facilitates more number of branches plant^{-1} and moreover potassium plays a major role in cell division and elongation and metabolism of carbohydrates and protein compounds. Kanwar *et al.* (2013) who found that fertigation with 120% RDF produced maximum number of branches plant^{-1} (3.97) followed by 100% RDF (3.57). Wahocho *et al*. (2016) reported that the maximum (9.42) numbers of branches were observed at increasing N level of 250 kg ha^{-1}. Brahma *et al.* (2010) revealed that fertigation with 100% RD of N and K_2O @ 120: 60 kg ha^{-1} produced significantly higher no. of branches (10.70). Similar results were reported by Polowick and Sawlancy (1985); Beese *et al.* (1982) in capsicum.

Number of leaves plant^{-1}. Number of leaves were significant at 60, 90 and 120 and was not significant at 30, 150 and at final harvest. It ranged from 11.00 to 16.07 at 30 DAT, 30.47 to 40.20 at 60 DAT, 40.73 to 61.13 at 90 DAT, 47.67 to 66.47 at 120 DAT, 48.00 to 62.65 at 150 DAT and 47.68 to 62.19 at final harvest. The no. of leaves of capsicum was recorded to be maximum at 120 DAT. The effect of interactions were observed to be non significant. Among the nitrogen levels the highest number of leaves plant^{-1} were recorded with N_{180} at all the stages (30, 60, 90, 120, 150 and at final harvest), which was significantly superior than all other levels and on par with N_{150}. The lowest were recorded with N_0. With regard to varied potassium doses K_{100} recorded significantly the highest number of leaves plant^{-1} while the lowest were recorded with K_0.

It is known that leaves are the major site of photosynthesis and act as a major source for different type of sink. Increased uptake of nutrients results in increased plant height and higher branches, which triggers the production of Indole Acetic Acid (IAA), plant growth hormone, higher number of leaves throughout the cropping period as reported by Sanker *et al.* (2008). As compared to open field condition production of number of leaves was higher in poly house condition with nitrogen and potash.

Leaf chlorophyll content (SPAD meter readings). No significant difference observed with N and K fertigation at 30, 60, 150, and final harvest and it was found to be significant at 90, 120 DAT and their interaction effect at any growth stage was not significant. The SPAD readings ranged from 40.87 to 51.48 at 30 DAT, 48.81 to 61.74 at 60 DAT, 49.39 to 64.11 at 90 DAT, 53.63 to 67.94 at 120 DAT, 50.53 to 66.95 at 150 DAT, 49.87 to 65.51 at final harvest. Nitrogen fertigation of N_{180} recorded the highest SPAD meter reading at all stages (30, 60, 90, 120, 150 and at final harvest) followed by N_{150} and the lowest was recorded with control N_0. Among potassium fertigation significantly the highest SPAD meter reading was observed with K_{100}, while the lowest was recorded with K_0.

Higher doses of nitrogen and potash and their combinations increases the chlorophyll content in leaves. An increase in leaf chlorophyll content was observed up to 120 DAT and there after it declined gradually due to the senescense of leaves at later stages. As the application of nitrogen contributes to the formation of chlorophyll, thus increase the chlorophyll content was visualized by dark green colour of the leaves. These results are similar with Naik (2005), Kavitha *et al*. (2005) in tomato.

Leaf Area Index (LAI). The LAI values *i.e*. 0.061 to 0.087 at 30 DAT, 0.580 to 0.905 at 60 DAT, 0.942 to 1.477 at 90 DAT, 0.988 to 2.124 at 120 DAT, 1.177 to 1.884 at 150 DAT and 1.097 to 1.805 at final harvest. Leaf Area Index was not significantly influenced at 30, 150 DAT and at final harvest and it was significant at 60, 90, 120 DAT. The LAI has reached to the maximum value at 120 DAT. The effect of interactions were non significant. It was found to be significant at 60, 90, 120 DAT. The increase in leaf area is a positive indication of response of growth factors in many of the nutritional investigation. The highest LAI was recorded with N_{180} which was significantly superior over all other levels except N_{150} and the lowest was recorded with N_0. The highest LAI was noticed with K_{100} compared to control (K_0), which recorded the lowest value.

The increase in leaf area is a positive indication of response of growth factors in many of the nutritional investigation and also directly indicates the increase in photosynthetic activity of a plant producing more of photosynthates and more metabolic activity. Their combination produced more leaf area due to proper utilization of nutrition. The LAI increased gradually with increase in N and K fertigation levels at all the growth stages due to better N and K nutrients availability and absorption by the plants resulted in more number of leaves and higher LAI. These findings were in agreement with Mounika (2016) in paprika, Nanda and Mahapatra (2004) in tomato and Sahoo *et al*. (2002) in tomato, Santos *et al.* (2003) in capsicum.

Dry matter production - shoot and fruit (kg ha^{-1}). There was an increasing trend observed with the total DM production of capsicum with increase in the N and K fertigation levels. It was noticed that there was a significant difference between potassium fertigation levels at all stages. Values ranged from 27.34 to 96.06 at 30 DAT, 127.02 to 268.27 at 60 DAT, 569.00 to 888.64 at 90 DAT, 976 to 1430.80 at 120 DAT, 1282.78 to 1902.22 at 150 DAT, 1462.56 to 2162.00 at final harvest. The highest total dry matter was recorded with N_{180}, which was superior over all other levels and was on par with N_{150}. The lowest was recorded with N_0. It was noticed that there was a significant difference between potassium fertigation levels at all stages; The highest total dry matter was noticed with K_{100}, when compared with K_{80} and K_0.

Due to higher uptake of nutrients and moisture from early stage of the crop which resulted in better utilization of nitrogen leading to higher plant height, higher leaf area and leaf area index with the higher photosynthetic rate for building organic substances in the plant. Similar results obtained with Aminifard *et al.* (2012); Malik *et al.* (2011); Choudhary and Bhambri (2012) in capsicum and Veeranna *et al*. (2000) in chilli.

CONCLUSION

Finally, it can be concluded that, among different nitrogen fertigation levels,180% RD of N (324 kg N ha^{-1}) recorded the highest value in all crop growth parameters *i.e* plant height, no. of branches, no. of leaves, LAI, SPAD chlorophyll reading, total dry matter production followed by 150 % RD (270 kg N ha^{-1}) of N. Among different potassium doses, 100 % RD (120 kg K_2O ha^{-1}) of K_2O recorded significantly higher values.

Table 1: Effect of N and K fertigation levels on plant height (cm) of capsicum under poly house at 30, 60, 90, 120, 150 DAT and at final harvest during *rabi* 2019-20.

30 DAT					60 DAT					90 DAT				
	K_0	K_{80}	K_{100}	Mean		K_0	K_{80}	K_{100}	Mean		K_0	K_{80}	K_{100}	Mean
N_0	21.9	22.1	23.6	**22.5**	N_0	38.8	38.7	42.6	**40.0**	N_0	66.5	69.0	72.0	**69.1**
N_{120}	22.2	22.9	23.8	**23.0**	N_{120}	40.0	42.5	45.1	**42.5**	N_{120}	67.4	71.7	74.4	**71.1**
N_{150}	23.6	23.3	24.8	**23.9**	N_{150}	41.9	45.2	49.2	**45.4**	N_{150}	72.2	73.6	78.1	**74.6**
N_{180}	23.4	25.4	24.7	**24.5**	N_{180}	43.0	47.7	51.0	**47.2**	N_{180}	73.2	76.2	82.3	**77.2**
Mean	**22.8**	**23.4**	**24.2**		**Mean**	**40.9**	**43.5**	**47.0**		**Mean**	**69.8**	**72.6**	**76.7**	
	S.E.m±	**C.D (P=0.05)**				**S.E.m ±**	**C.D (P=0.05)**				**S.E.m±**	**C.D P=(0.05)**		
N	0.52	NS			**N**	1.01	2.97			**N**	1.53	4.46		
K	0.45	NS			**K**	0.88	2.57			**K**	1.32	3.87		
(N*K)	0.91	NS			**(N*K)**	1.76	NS			**(N*K)**	2.64	NS		

120 DAT					150 DAT					Final harvest				
	K_0	K_{80}	K_{100}	Mean		K_0	K_{80}	K_{100}	Mean		K_0	K_{80}	K_{100}	Mean
N_0	90.4	90.9	90.3	**90.5**	N_0	87.1	91.2	90.6	**89.7**	N_0	86.3	87.5	90.3	**88.0**
N_{120}	89.5	92.1	95.6	**92.4**	N_{120}	90.1	92.9	93.7	**92.2**	N_{120}	89.1	93.8	92.6	**91.8**
N_{150}	95.0	90.6	99.5	**95.0**	N_{150}	95.0	92.7	99.1	**95.6**	N_{150}	95.0	89.7	98.0	**94.2**

N_{180}	91.0	99.0	101.8	**97.2**	**N_{180}**	91.2	97.3	100.3	**96.3**	**N_{180}**	89.9	96.6	99.3	**95.3**
Mean	**91.5**	**93.1**	**96.8**		**Mean**	**90.9**	**93.5**	**95.9**		**Mean**	**90.1**	**91.9**	**95.0**	
	S.E.m±	**C.D (P=0.05)**				**S.E.m±**	**C.D (P=0.05)**				**S.E.m±**	**C.D P=(0.05)**		
N	1.63	4.77			**N**	1.90	NS			**N**	1.85	NS		
K	1.41	4.13			**K**	1.65	NS			**K**	1.60	NS		
(N*K)	2.83	NS			**(N*K)**	3.29	NS			**(N*K)**	3.21	NS		

100% RDF = 180: 90: 120 kg N-P_2O_5-K_2O ha^{-1}, N_0 –No Nitrogen, N_{120} - 216 kg N ha^{-1}, N_{150} - 270 kg N ha^{-1}, N_{180}- 324 kg N ha^{-1}
K_0 –No potassium, K_{80} - 96 kg K_2O ha^{-1}, K_{100} - 120 kg K_2O ha^{-1}.

Table 2: Effect of N and K fertigation levels on number of branches plant^{-1} of capsicum under poly house at 30, 60, 90, 120, 150 DAT and at final harvest during *rabi* 2019-20.

30 DAT					**60 DAT**					**90 DAT**				
	K_0	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**
N_0	0.97	1.18	1.31	**1.15**	**N_0**	2.47	2.60	2.80	**2.62**	**N_0**	3.87	3.93	4.27	**4.02**
N_{120}	1.20	1.27	1.07	**1.18**	**N_{120}**	2.53	2.87	3.00	**2.80**	**N_{120}**	4.27	4.20	4.47	**4.31**
N_{150}	1.27	1.47	1.40	**1.38**	**N_{150}**	2.93	2.93	3.20	**3.02**	**N_{150}**	4.27	4.47	4.93	**4.56**
N_{180}	1.13	1.40	1.73	**1.42**	**N_{180}**	2.87	3.27	3.53	**3.22**	**N_{180}**	4.33	4.67	5.37	**4.79**
Mean	**1.14**	**1.33**	**1.38**		**Mean**	**2.70**	**2.92**	**3.13**		**Mean**	**4.18**	**4.32**	**4.76**	
	S.E.m±	**C.D (P=0.05)**				**S.E.m±**	**C.D (P=0.05)**				**S.E.m±**	**C.D P=(0.05)**		
N	0.08	NS			**N**	0.15	NS			**N**	0.13	0.39		
K	0.07	NS			**K**	0.13	NS			**K**	0.11	0.34		
(N*K)	0.14	NS			**(N*K)**	0.26	NS			**(N*K)**	0.23	NS		

120 DAT					**150 DAT**					**Final harvest**				
	K_0	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**
N_0	4.4	4.56	4.67	**4.54**	**N_0**	4	4.2	4.27	**4.16**	**N_0**	4.09	4.11	4.19	**4.13**
N_{120}	4.6	4.8	5	**4.8**	**N_{120}**	4.2	4.2	4.47	**4.29**	**N_{120}**	4.25	4.27	4.44	**4.32**
N_{150}	4.67	4.93	6.17	**5.26**	**N_{150}**	4.27	4.47	4.93	**4.56**	**N_{150}**	4.4	4.44	4.8	**4.55**
N_{180}	4.67	5.77	6.83	**5.76**	**N_{180}**	4.43	4.73	5.37	**4.84**	**N_{180}**	4.37	4.62	4.91	**4.64**
Mean	**4.58**	**5.02**	**5.67**		**Mean**	**4.23**	**4.4**	**4.76**		**Mean**	**4.28**	**4.36**	**4.59**	
	S.E.m±	**C.D (P=0.05)**				**S.E.m±**	**C.D (P=0.05)**				**S.E.m±**	**C.D (P=0.05)**		
N	0.21	0.6			**N**	0.2	NS			**N**	0.2	NS		
K	0.18	0.52			**K**	0.18	NS			**K**	0.17	NS		
(N*K)	0.36	NS			**(N*K)**	0.35	NS			**(N*K)**	0.34	NS		

100% RDF = 180: 90: 120 kg N-P_2O_5-K_2O ha^{-1}, N_0 –No Nitrogen, N_{120} - 216 kg N ha^{-1}, N_{150} - 270 kg N ha^{-1}, N_{180}- 324 kg N ha^{-1}
K_0 –No potassium, K_{80} - 96 kg K_2O ha^{-1}, K_{100} - 120 kg K_2O ha^{-1}.

Table 3: Effect of N and K fertigation levels on number of leaves plant^{-1} of capsicum under poly house at 30, 60, 90, 120, 150 DAT and at final harvest during *rabi* 2019-20.

30 DAT					**60 DAT**					**90 DAT**				
	K_0	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**
N_0	11.00	11.20	11.23	**11.14**	**N_0**	30.47	31.40	33.13	**31.67**	**N_0**	40.73	41.67	42.67	**41.69**
N_{120}	11.47	13.60	13.07	**12.71**	**N_{120}**	32.60	33.67	34.47	**33.58**	**N_{120}**	40.47	45.07	45.20	**43.58**
N_{150}	11.40	13.07	15.93	**13.47**	**N_{150}**	34.60	35.07	38.93	**36.20**	**N_{150}**	39.80	47.47	57.00	**48.09**
N_{180}	12.87	13.80	16.07	**14.24**	**N_{180}**	36.73	35.40	40.20	**37.44**	**N_{180}**	43.27	51.87	61.13	**52.09**
Mean	**11.68**	**12.92**	**14.08**		**Mean**	**33.60**	**33.88**	**36.68**		**Mean**	**41.07**	**46.52**	**51.50**	
	S.E.m±	**C.D (P=0.05)**				**S.E.m±**	**C.D (P=0.05)**				**S.E.m±**	**C.D P=(0.05)**		
N	0.82	NS			**N**	0.90	2.64			**N**	1.58	4.62		
K	0.71	NS			**K**	0.78	2.28			**K**	1.37	4.00		
(N*K)	1.42	NS			**(N*K)**	1.56	NS			**(N*K)**	2.73	NS		
120 DAT					**150 DAT**					**Final harvest**				
	K_0	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**		**K_0**	**K_{80}**	**K_{100}**	**Mean**
N_0	47.67	48.53	48.13	**48.11**	**N_0**	48	49.27	51	**49.42**	**N_0**	47.68	48.13	49.53	**48.45**
N_{120}	49.2	51.13	51.67	**50.67**	**N_{120}**	51.04	51.13	53.73	**51.97**	**N_{120}**	48.20	50.73	53.07	**50.67**
N_{150}	48.73	51.73	61.67	**54.04**	**N_{150}**	51.6	51.73	56.53	**53.29**	**N_{150}**	49.73	53.6	57.47	**53.60**
N_{180}	52.53	52.87	66.47	**57.29**	**N_{180}**	51.53	55.73	62.65	**56.64**	**N_{180}**	48.87	56.4	62.19	**55.82**
Mean	**49.53**	**51.07**	**56.98**		**Mean**	**50.54**	**51.97**	**55.98**		**Mean**	**48.62**	**52.22**	**55.57**	
	S.E.m±	**C.D (P=0.05)**				**S.E.m±**	**C.D (P=0.05)**				**S.E.m±**	**C.D (P=0.05)**		
N	1.90	5.56			**N**	2.32	NS			**N**	2.71	NS		
K	1.65	4.82			**K**	2.01	NS			**K**	2.34	NS		
(N*K)	3.29	NS			**(N*K)**	4.01	NS			**(N*K)**	4.69	NS		

100% RDF = 180: 90: 120 kg N-P_2O_5-K_2O ha^{-1}, N_0 –No Nitrogen, N_{120} - 216 kg N ha^{-1}, N_{150} - 270 kg N ha^{-1}, N_{180}- 324 kg N ha^{-1}
K_0 –No potassium, K_{80} - 96 kg K_2O ha^{-1}, K_{100} - 120 kg K_2O ha^{-1}.

Table 4: Effect of N and K fertigation levels on SPAD chlorophyll meter reading of capsicum under poly house at 30, 60, 90, 120, 150 DAT and at final harvest during *rabi* 2019-20.

30 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	40.87	41.33	41.83	**41.35**
N_{120}	41.32	43.72	45.42	**43.49**
N_{150}	44.97	46.35	49.81	**47.04**
N_{180}	46.83	46.61	51.48	**48.31**
Mean	**43.5**	**44.5**	**47.14**	
	S.E.m±	**C.D (P=0.05)**		
N	2.06	NS		
K	1.79	NS		
(N*K)	3.57	NS		

60 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	48.81	49.75	53.85	**50.80**
N_{120}	53.06	53.71	55.53	**54.10**
N_{150}	55.67	56.41	59.23	**57.10**
N_{180}	55.19	57.98	61.74	**58.30**
Mean	**53.18**	**54.46**	**57.59**	
	S.E.m±	**C.D (P=0.05)**		
N	2.24	NS		
K	1.94	NS		
(N*K)	3.87	NS		

90 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	49.39	50.34	54.29	**51.34**
N_{120}	51.23	53.66	56.87	**53.92**
N_{150}	56.23	58.33	60.84	**58.47**
N_{180}	56.5	58.79	64.11	**59.80**
Mean	**53.34**	**55.28**	**59.03**	
	S.E.m±	**C.D (P=0.05)**		
N	154	4.5		
K	1.33	3.89		
(N*K)	2.66	NS		

120 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	53.63	55.94	57.38	**55.65**
N_{120}	55.38	58.66	60.93	**58.32**
N_{150}	60.26	62.51	64.92	**62.56**
N_{180}	58.64	63.67	67.94	**63.42**
Mean	**56.98**	**60.20**	**62.79**	
	S.E.m±	**C.D (P=0.05)**		
N	1.42	4.15		
K	1.23	3.59		
(N*K)	2.46	NS		

150 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	50.53	53.00	55.12	**52.88**
N_{120}	53.27	56.70	57.58	**55.85**
N_{150}	49.89	60.47	60.69	**57.01**
N_{180}	55.19	61.07	66.95	**61.07**
Mean	**52.22**	**57.81**	**60.08**	
	S.E.m±	**C.D (P=0.05)**		
N	2.78	NS		
K	2.41	NS		
(N*K)	4.82	NS		

Final harvest				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	49.87	51.68	53.54	**51.69**
N_{120}	51.97	54.64	56.43	**54.35**
N_{150}	48.18	58.93	59.47	**55.53**
N_{180}	53.66	58.17	65.51	**59.12**
Mean	**50.92**	**55.85**	**58.74**	
	S.E.m±	**C.D P=(0.05)**		
N	2.54	NS		
K	2.20	NS		
(N*K)	4.39	NS		

100% RDF = 180: 90: 120 kg N-P_2O_5-K_2O ha^{-1}, N_0 –No Nitrogen, N_{120} - 216 kg N ha^{-1}, N_{150} - 270 kg N ha^{-1}, N_{180}- 324 kg N ha^{-1}
K_0 –No potassium, K_{80} - 96 kg K_2O ha^{-1}, K_{100} - 120 kg K_2O ha^{-1}.

Table 5: Effect of N and K fertigation levels on Leaf Area Index (LAI) of capsicum under poly house at 30, 60, 90, 120, 150 DAT and at final harvest during *rabi* 2019-20.

30 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	0.062	0.066	0.061	**0.063**
N_{120}	0.066	0.065	0.072	**0.068**
N_{150}	0.063	0.075	0.082	**0.073**
N_{180}	0.071	0.077	0.087	**0.079**
Mean	**0.065**	**0.071**	**0.076**	
	S.E.m±	**C.D (P=0.05)**		
N	0.004	NS		
K	0.003	NS		
(N*K)	0.007	NS		

60 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	0.580	0.611	0.722	**0.638**
N_{120}	0.650	0.723	0.705	**0.693**
N_{150}	0.694	0.739	0.832	**0.755**
N_{180}	0.686	0.831	0.905	**0.808**
Mean	**0.653**	**0.726**	**0.791**	
	S.E.m±	**C.D (P=0.05)**		
N	0.019	0.057		
K	0.017	0.049		
(N*K)	0.034	NS		

90 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	0.942	0.999	1.154	**1.031**
N_{120}	1.170	1.189	1.208	**1.189**
N_{150}	1.162	1.283	1.420	**1.288**
N_{180}	1.154	1.348	1.477	**1.326**
Mean	**1.107**	**1.205**	**1.315**	
	S.E.m±	**C.D (P=0.05)**		
N	0.027	0.079		
K	0.023	0.068		
(N*K)	0.047	NS		

120 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	0.988	1.183	1.273	**1.148**
N_{120}	1.424	1.419	1.361	**1.401**
N_{150}	1.296	1.632	1.928	**1.619**
N_{180}	1.389	1.717	2.124	**1.743**
Mean	**1.274**	**1.488**	**1.671**	
	S.E.m±	**C.D (P=0.05)**		
N	0.067	0.197		
K	0.058	0.171		
(N*K)	0.117	NS		

150 DAT				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	1.177	1.206	1.460	**1.281**
N_{120}	1.368	1.583	1.415	**1.455**
N_{150}	1.427	1.553	1.762	**1.581**
N_{180}	1.505	1.604	1.884	**1.664**
Mean	**1.369**	**1.486**	**1.63**	
	S.E.m±	**C.D (P=0.05)**		
N	0.1	NS		
K	0.087	NS		
(N*K)	0.174	NS		

Final harvest				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	1.097	1.198	1.460	**1.252**
N_{120}	1.337	1.578	1.401	**1.439**
N_{150}	1.423	1.553	1.714	**1.563**
N_{180}	1.492	1.547	1.805	**1.615**
Mean	**1.337**	**1.469**	**1.595**	
	S.E.m±	**C.D (P=0.05)**		
N	0.093	NS		
K	0.081	NS		
(N*K)	0.162	NS		

1000% RDF = 180: 90: 120 kg N-P_2O_5-K_2O ha^{-1}, N_0 –No Nitrogen, N_{120} - 216 kg N ha^{-1}, N_{150} - 270 kg N ha^{-1}, N_{180}- 324 kg N ha^{-1}
K_0 –No potassium, K_{80} - 96 kg K_2O ha^{-1}, K_{100} - 120 kg K_2O ha^{-1}

Table 6: Effect of N and K fertigation levels on total dry matter production (kg ha^{-1}) of capsicum under poly house at final harvest (shoot + fruit) during *rabi* 2019-20.

Final harvest

Shoot				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	530.33	546.23	622.00	**566.19**
N_{120}	597.83	665.33	670.00	**644.39**
N_{150}	616.00	676.67	729.33	**674.00**
N_{180}	606.33	712.67	747.33	**688.78**
Mean	**587.63**	**650.23**	**692.17**	
	S.E.m±	**C.D (P=0.05)**		
N	21.27	62.22		
K	18.42	53.88		
(N*K)	36.83	NS		

Fruit				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	932.22	977.00	1160	**1023.07**
N_{120}	1018.78	1139.56	1234.22	**1130.85**
N_{150}	1089.22	1251.11	1357.78	**1232.70**
N_{180}	1123.89	1305.78	1414.67	**1281.44**
Mean	**1041.03**	**1168.36**	**1291.67**	
	S.E.m±	**C.D (P=0.05)**		
N	38.42	112.4		
K	33.27	97.34		
(N*K)	66.54	NS		

Total dry matter (kg ha^{-1})				
	K_0	**K_{80}**	**K_{100}**	**Mean**
N_0	1462.56	1523.23	1782.00	**1589.26**
N_{120}	1616.61	1804.89	1904.22	**1775.24**
N_{150}	1705.22	1927.78	2087.11	**1906.70**
N_{180}	1730.22	2018.44	2162.00	**1970.22**
Mean	**1628.65**	**1818.59**	**1983.83**	
	S.E.m±	**C.D (P=0.05)**		
N	58.12	170.02		
K	50.33	147.24		
(N*K)	100.66	NS		

100% RDF = 180: 90: 120 kg N-P_2O_5-K_2O ha^{-1}, N_0 –No Nitrogen, N_{120} - 216 kg N ha^{-1}, N_{150} - 270 kg N ha^{-1}, N_{180}- 324 kg N ha^{-1}
K_0 –No potassium, K_{80} - 96 kg K_2O ha^{-1}, K_{100} - 120 kg K_2O ha^{-1}

REFERENCES

Aminifard, M.H., Aroiee, H., Ameri, A and Fatemi, H. (2012). Effect of plant density and nitrogen fertilizer on growth, yield and fruit quality of sweet pepper (*Capsicum annum* L.). *African Journal of Agricultural Research*, *7*(6): 859-866.

Anonymous (2006). Importance of vegetables. www.thehindubusiness.com

Anonymous (2014). Annual Production by Crop Quick Reference, www.FAO STATS.

Beese, T., Horton, R. and Wierenger (1982). Growth and yield response of chilli pepper to trickle irrigation. *Agronomy Journal, 72*: 556-61.

Brahma, S., Saikia, L., Barua, P., Hazarika, T. and Sharma, B. (2010). Studies on effect of fertigation with different levels of N and K fertilizers on growth, yield, quality and economics of early season capsicum (*Capsicum annuum* var. *grossum* L.) under cover. *Journal of Vegetation Science*, *37*(2): 160-163.

Choudhary, V. K and Bhambri, M. C. (2012). Agro-economic potential of capsicum with drip irrigation and mulching. *SAARC Journal of Agriculture*, *10*(2): 51-60.

Jan, N.E., Khan, I.A., Sher, Ahmed, Shafiullah, and Rash, Khan (2006). Evaluation of optimum dose of fertilizer and plant spacing for sweet peppers cultivation in Northern Areas of Pakisthan. *Journal of Agriculture*. 22(4): 601-606.

Kanwar, D.P.S., Dikshit, S.N., Sharma, H.L., Patel, K.L., Rajesh A and Sarnaik, D.A. (2013). Effect of fertigation on growth and yield attributing characters of sweet pepper under black polyethylene mulch. *Journal on Soils and Crops*, *23* (1): 73-77.

Kavitha, M. Natarajan, S. Pugalendhi, L and Meenekshi, M. (2005). Influence of shade and fertigation on physiological and yield parameters of tomato. Department of Vegetable crops. Horticultural College and Research Institute. Tamil Nadu Agricultural University. Coimbatore-3.

Kurubetta, Y., and Patil, A.A. (2009). Performance of coloured capsicum hybrids under different protected structures. Karnataka journal of agricultural sciences, *22*(5): 1058-1061.

Malik, A. A., Chattoo, M., Sheemar, G. and Rashid, R. (2011). Growth, yield and fruit quality of sweet pepper hybrid SH-SP-5 (*Capsicum annuum* L.) as affected by integration of inorganic fertilizers and organic manures (FYM). *Journal of Agricultural Technology*, *7*(4): 1037-1048.

Malshe, K.V., Palshetkar G. and Desai, B.G. (2016). Comparative study of different capsicum varieties under open and protected conditions. *Plant Archives*, (2): 931-933.

Mohanty, B., Hossam, M.M. and Nanda, S.K. (2001). Response of chilli OJ. Utkal Rashmi to nitrogen, phosphorous and potash. *The Orissa Journal of Horticulture, 29*(2): 11-49.

Mounika, D. (2016). Paprika (*Capsicum annum* L.) response to fertigation levels of nitrogen and potassium. *M.Sc. Thesis*. Professor Jayashankar Telangana State Agricultural University, Hyderabad, India.

Naik, R. K. (2005). Influence of N-substitution levels through organic and inorganic sources on growth, yield and post-harvest quality of capsicum under protected condition. *Ph. D. Thesis*. University of Agriculture Science, Dharwad, Karnataka, India.

Nanda, S. and Mahapatra, P. (2004). Integrated effect of bio inoculation and chemical fertilization on yield and quality of tomato (*Lycopersicon esculentum*) *M. sc.* (*Ag*) *Thesis* submitted to Orissa University of Agriculture and Technology.

Navale, A.V., Nandagude, S.B., Pawar, A.G., Ghodke, H.M., and Bhosale, A.D. (2003). Comparative study of skirting and top covering effect in low cost greenhouse. Proc. of All India on Seminar Potential and Prospects for Protective Cultivation, organized by the Institute of Engineers, Ahmednagar, 12-13, 97.

Polowick, P.L. and Sawhney, V.K. (1985). Temperature effects on male fertility and flower and fruit development in (*Capsicum annuum* L.) *Scientia Horticulture, 25*(2): 117-127.

Sahoo, D., Mahapatra, P., Das, A.K. and Sahoo, N.R. (2002). Effect of nitrogen and potassium on growth and yield of tomato (*Lycopersicon esculentum*) var. Utkal Kumari. *The Orissa Journal of Horticulture*, *30* (1).

Sankar, V.; Lawande, K.E. and Tripathy, P.C. (2008). Effect of micro irrigation on growth, yield and water-use-efficiency of onion (*Allium cepa*) under western Maharashtra conditions. *Indian Journal of Agricultural Sciences*, *78*(7): 584-588.

Santos, R.F., Klar, A.E., Frigo, E.P. and Correa, M.M. (2003). Application of different nitrogen and potassium doses on pepper crop grown under plastic tunnel and field conditions.

Telangana State Horticulture Mission. 2018-19. https://pub.greenecosystem.in/government-departments/telangana-state-horticulture-mission.html.

Veeranna, H. K. (2000). Effect of fertigation, irrigation and potassium levels on the productivity of chilli (*Capsicum annuum* L.). *Ph.D. Thesis*. University of Agricultural Sciences, Bangalore.

Wahocho, N.A., Zeshan Ahmed, S., Jogi, Q., Talpur, K.H. and Leghari, S.J. (2016). Growth and productivity of chilli (*Capsicum annuum* L.) under various nitrogen levels. *Science International*, *28*(2).

How to cite this article: B. Gouthami, M. Uma Devi M., K. Avil Kumar and V. Ramulu (2022). Growth Parameters of Capsicum (*Capsicum annuum* var. *grossum* L.) as Influenced by Different Nitrogen and Potassium Fertigation Levels under Poly House. *Biological Forum – An International Journal*, *14*(2): 624-629.