

## Effect of nitrogen and potassium on yield and quality of Bell pepper (*Capsicum annuum* L.grossom) cv. California Wonder under open field and shade net condition

N. Mishra<sup>1</sup>, G. S. Sahu<sup>2</sup> and M. Ray<sup>3</sup>

**Abstract:** A field experiment was carried out in the department of Horticulture, College of Agriculture, OUAT, Bhubaneswar with randomized block design (Factorial) with four doses of nitrogen (125, 150, 175 and 200 Kg/ha) and two doses of potash (125 and 150 Kg/ha) and their combinations in open field as well as shade net condition to find out the individual effect and their combination on different yield and yield attributing parameters under Bhubaneswar agro-climatic condition during 2008-09. number of fruits per plant, ascorbic acid content, T.S.S. (°brix), 100 seeds weight, yield per plot, and Yield per hectare were recorded during the course of investigation. It was found that most of the yield and yield attributing traits were increased due to higher doses of nitrogen and potash. However, application of N3K2 (175:150 Kg/ha) along with P at a constant rate of 75 kg/ha was found to be the best both in open and shade net condition which increased the most economic characters.

### INTRODUCTION

In India, the hot and sweet peppers (green) are grown in an area of 5400 hectares with a production of 49,000 tonnes (Swarup, 2006). The main growing states in India are Himachal Pradesh, Karnataka, Tamil Nadu, Maharashtra, Andhra Pradesh, Uttaranchal, Madhya Pradesh, West Bengal, Rajasthan, Punjab, Orissa, North eastern states and Bihar. Sweet peppers are very rich in vitamins, even more so than the tomatoes especially in A and C. Nutrients play an important role in improving the productivity and quality of capsicum fruits. Nitrogen enhances plant vigor, leaf area and size of the fruit. It is an essential part of nucleic acids and chlorophyll molecules. Both phosphorus and potassium are equally important for plant growth, the former is known to participate in energy transfer and carbohydrate metabolism whereas the later (potassium) improves the quality of fruits by taking part in number of biological reactions and

translocation of food material to different plant parts. In order to encourage cultivation of capsicum with economized production cost, it is essential to optimize the nutrient requirement augmenting productivity through appropriate agro-techniques particularly based on proper nutrient management assumes significance. Since the quality and quantity do not normally go together, it was thought desirable to assess the effect of graded doses of nitrogen, phosphorus and potassium on the yield and quality of capsicum.

### MATERIAL AND METHODS

The field experiment entitled "Effect of nitrogen and potassium on yield and yield attributing characters in Bell pepper (*Capsicum annuum* L.), cv. California Wonder" was carried out at experimental plots of the Department of Horticulture, College of Agriculture, O.U.A.T., Bhubaneswar in the year 2008-09. The experiment was conducted on sandy

<sup>1,&2</sup> Department of vegetable Science, <sup>3</sup> Department of Agronomy, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha (INDIA)-751003, E-mail: \*nityamanjari.mishra@gmail.com

loam soil with PH 6.03, organic carbon 0.39%, available N, P and K was 180, 20 and 120 kg/ha respectively. Bhubaneswar is located on 22°15' north altitude, 80°22' east longitude and on an altitude of 25.5 m above the mean sea level. It comes under tropical climate zone. Bhubaneswar is around 62 km. away from Bay of Bengal towards west. The precipitation during the cropping period was about 37.7 mm which was received between October, 2008 to February, 2009. The average maximum temperature during the period varies between 32.6°C to 30.1°C. The present experiment constitutes 8 treatments comprising of combinations of four different doses of nitrogen (125, 150, 175 and 200 Kg/ha), two different doses of potash(125 and 150 Kg/ha) and constant dose of phosphorus (75 kg/ha) and laid out in Randomized Block design (factorial) with 3 replications. All the cultural operations were followed which were necessary to raise the good crop of capsicum.

## RESULT AND DISCUSSION

**Number of fruits per plant :** The range of number of fruits per plant was varied from 5.93 to 7.63 in open field condition and from 8.73 to 10.53 under

shade net condition. The maximum number of fruits per plant was recorded in N3K2 (7.63 and 10.53) and was significantly higher than the rest . But, the minimum number of fruits per plant was marked in N1K1(5.93 and 7.07 ) both open field condition and shade net condition respectively.. It was observed that the number of fruits per plant increased due to higher doses of nitrogen, potash and their combination which was comparatively more in shade net condition than in open field which may be due to more fruit set and better micro climate and increased allocation of photosynthes towards the economic parts i.e. formation of more flowers, hormonal balance and there by more number of fruits. Similar finding are also reported by Nanda and Mahapatra(2004) in tomato, Das *et al.*(1972) in capsicum, Nazeer *et al.* (1991) in chilli, Mavengahama *et al.* (2006) in paprika, Jan *et al.* (2006) in capsicum.

**Weight of 100 seeds:**From the present investigation it was observed that there was slight increase in seed weight under different treatments. However, under combined treatments N3K2(0.59 and 0.60 g in open field and shade net condition respectively) 100 seed weight was significantly

**Table 1**  
Number of fruits per plant, 100 seed weight(g), yield (t/ha), T.S.S. (<sup>o</sup>Brix) and ascorbic acid content(mg/100g) of fruit as affected by nitrogen and potassium in capsicum open field condition

Treatments		No. of fruits per plant	100 seed weight (g)	Yield (t/ha)	Ascorbic acid content (mg/100g)	T.S.S.( <sup>o</sup> Brix)
T <sub>1</sub>	N1K1	5.93	0.53	5.93	166.13	5.47
T <sub>2</sub>	N2K1	6.53	0.50	6.53	164.30	5.33
T <sub>3</sub>	N3K1	5.97	0.52	5.97	163.10	5.27
T <sub>4</sub>	N4K1	6.87	0.54	6.87	160.13	5.37
T <sub>5</sub>	N1K2	6.23	0.55	6.23	167.17	5.60
T <sub>6</sub>	N2K2	7.13	0.56	7.13	158.13	6.03
T <sub>7</sub>	N3K2	7.63	0.59	7.63	168.30	6.17
T <sub>8</sub>	N4K2	7.23	0.57	7.23	164.93	5.93
SEm±	N	0.08	0.011	0.08	0.53	0.09
	K	0.06	0.007	0.06	0.38	0.07
	NxK	0.11	0.015	0.11	0.75	0.13
CD <sub>(0.05)</sub>	N	0.24	–	0.24	1.62	–
	K	0.17	0.022	0.17	1.14	0.20
	NxK	0.34	–	0.34	2.28	–

**Table 2**  
**Number of fruits per plant, 100 seed weight(g), yield (t/ha), T.S.S. (<sup>o</sup>Brix) and ascorbic acid content(mg/100g) of fruit as affected by nitrogen and potassium in capsicum shade net condition**

Treatments		No. of fruits per plant	100 seed weight (g)	Yield (t/ha)	Ascorbic acid content (mg/100g)	T.S.S.( <sup>o</sup> Brix)
T <sub>1</sub>	N1K1	7.07	0.53	12.44	160.00	5.60
T <sub>2</sub>	N2K1	9.20	0.50	13.52	164.77	5.40
T <sub>3</sub>	N3K1	8.20	0.53	14.38	166.47	5.97
T <sub>4</sub>	N4K1	10.13	0.53	15.14	164.67	5.83
T <sub>5</sub>	N1K2	9.33	0.55	18.71	170.4	6.03
T <sub>6</sub>	N2K2	8.73	0.58	19.90	170.27	6.13
T <sub>7</sub>	N3K2	10.53	0.60	21.20	170.67	6.30
T <sub>8</sub>	N4K2	9.20	0.59	18.39	172.20	6.23
SEm±	N	0.32	0.007	0.32	2.13	0.05
	K	0.22	0.005	0.22	1.51	0.04
	NxK	0.45	0.009	0.45	3.02	0.07
CD <sub>(0.05)</sub>	N	0.96	0.020	0.95	—	0.15
	K	0.68	0.014	0.68	4.57	0.11
	NxK	1.36	0.028	1.35	—	—

higher than the other treatments. Similar finding was also reported by Sharma (2001) in paprika.

**Yield(t/ha):** Application of higher doses of nitrogen, potash and their combination have increased the yield both in open and shade net condition. The highest yield of fruit per hectare was recorded in N3K2 (7.63 and 21.20 t/ha) which was significantly higher than the rest and the lowest value was marked with N1K1 (5.93 and 12.44 t/ha) both open field and shade net condition respectively. The increase in yield due to particular treatment also recorded better performances of yield attributes which had positive influence in increasing the yield. It was observed that the most economic characters were greatly varied for same treatment in open and shade net condition. Shade net condition provide a better environment, completely weed free situation and some what less incidence of insect pest and disease for which this situation recorded significant yield increase over open condition. However, the optimum combination for highest yield was not the best combination indicating that there must be optimum combination between the plant nutrient for better nutrient use efficiency by the plant. This finding is in conformity

with the findings of Nanda and Mahapatra(2004) in tomato, Mavengahama *et al.* (2006) in paprika, Jan *et al.* (2006) in capsicum.

**Ascorbic acid content:** The ascorbic acid content of capsicum fruits varied significantly as compared to different treatment in open and shade net condition. The ascorbic acid is composed of carbohydrate constituting compound and as carbohydrate production is influenced by both N and K application, the increase in ascorbic acid content with higher doses of N and K and their combination was apparent. Similar trend was also reported by Nanda and Mahapatra(2004) in tomato, Pradeep *et al.* (2004) in chilli, Das *et al.* (1972) in capsicum.

**T.S.S. of fruit:** Investigation in the total soluble solid (T.S.S.) revealed that there is increase in TSS content of fruit with higher doses of nitrogen, potash and their combinations both in open field and shade net condition. The maximum T.S.S. was recorded in N<sub>3</sub>K<sub>2</sub>(6.17 and 6.30 <sup>o</sup>Brix)in and was significantly higher than the rest both open field condition and shade net condition respectively. Application of higher doses of nutrient and combination had formed more carbohydrates leading to increase in

T.S.S. was also reported in by Nanda and Mahapatra(2004) in tomato and Pradeep *et al.* (2004) in chilli.

## CONCLUSION

Application of higher doses of nitrogen and potash and their combination resulted in better performance of capsicum and recorded higher values for yield and yield attributing characters and quality of fruit. It was found that application of  $N_3K_2$ (175 and 125 kg/ha) performed better than the higher combination of nitrogen and potash i.e.  $N_4K_2$ . It indicates that there exists an optimum combination between N and K beyond which the application of higher doses of nitrogen did not produced good result.

## References

- Das, R.C. and Mishra, S. N. (1972), Effect of nitrogen, phosphorus and potassium on growth yield and quality of chilli (*Capsicum annuum* L.). *Plant Sci*, 4: 78-83; 11 ref.
- Jan, N.E.; Khan, I.A., Sher, A. and Khan, S.R. (2006), Evaluation of optimum dose of fertilizer and plant spacing for sweet peppers cultivation in Northern Areas of Pakistan. *Sarhad J. of Agril.*, 22(4):601-606.
- Mavengahama, S., Ogunlela, V.B., Mariga, I.K. (2006), Response of paprika (*capsicum annum* L.) to basal fertilizer application and ammonium nitrate. *Crop research-Hisar*, 32(3): 421-429.
- Nanda, S. and Mahapatra, P. (2004), Integrated effect of bioinoculation and chemical fertilization on yield and quality of tomato *Lycopersicon esculentum* M.sc.(Ag) Thesis. O.U.A.T.(Unpublished). Pages : 30-48.
- Nazeer, A., Tanki, M. I., Ahmed, N. (1991), Response of chill (*capsicum annum* L.) to nitrogen and phosphorous. *Haryana J. of Hort. Sci.*, 20: (1-2): 114-118.
- Pradeep, K., Sharma S.K. and Bhardwaj, S.K. (2004), Effect of integrated use of phosphorus on growth, yield and quality of tomato. *Progressive Hort.*, Vol. 36(2):317-320.
- Sharma, S.K. (2001), Effect of nitrogen and spacing on seed production of paprika. *Vegetable Sci.*, 28(2):175-176.
- Swarup, V. (2006), chilli and pepper. In *vegetable science and Technology in India* (Ed. Visnu Swarup) Kalyani publishers, New Delhi, India.