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Effect of NPK on quality parameters of capsicum (*Capsicum annuum* L. var. Grossum) under protected condition

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Abstract

The present investigation 'Effect of NPK on quality parameters of Capsicum (*Capsicum annuum* L. var. Grossum) under protected condition' was carried out at polyhouse complex, Department of Vegetable Science, College of Horticulture and Forestry, Pasighat, Arunachal Pradesh in the year 2017-2018. The experiment was carried out in factorial Randomized Block Design with 8 treatments which were replicated 3 times. Capsicum variety was taken up as the first factor *i.e.*, V₁-Asha (green var.) and V₂-Bomby (red var.) and second factor were NPK (19:19:19) levels *viz.* T₁-NPK@250 kg/ha, T₂-NPK@300 kg/ha, T₃ NPK@350 kg/ha and T₄-NPK@400 kg/ha. Experimental results showed that the incorporation of the different NPK levels had a positive effect on quality parameters of the varieties. The higher total carotenoids content (4.30 mg/100gm) and ascorbic acid content (139.74 mg/100gm) was recorded in var. Bomby (V₂) under T₄ (NPK@400 kg/ha). The chlorophyll content was found more in var. Asha (1.81 mg/gm).

Keywords: Ascorbic acid, Capsicum, carotenoids, chlorophyll, quality

Introduction

Capsicum (*Capsicum annuum* L. var. Grossum Sendt.) is commonly known as sweet pepper or bell pepper or Shimla mirch. It belongs to the family Solanaceae and is believed to be a native of Tropical South America (Shoemaker and Teskey, 1995) [16]. It was introduced in India by the Britishers in the 19th century in Shimla hills.

In India, bell pepper occupies an area of 30 thousand hectares with production of 183 thousand metric tonnes (Anon., 2015) [5]. Bell pepper is basically a cool season tropical crop and lacks adaptability to varied environmental conditions. High temperature promoted flower drop and reduced fruit set in bell pepper (Erickson and Markhart, 2001) [10]. It is commercially grown in Himachal Pradesh, Jammu and Kashmir, Uttarakhand, Arunachal Pradesh and Darjeeling district of West Bengal during summer season and as an autumn crop in Maharashtra, Karnataka, Tamil Nadu, Uttar Pradesh and Bihar.

It is rich in vitamin A (180 IU), vitamin C, rutin (a bioflavonoid), β-carotene, iron, calcium and potassium (Agarwal *et al.*, 2007) [2]. 100 gram 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 (Anon., 2006) [4]. Sweet pepper is relatively non-pungent or less pungent with thick flesh and it is the world's second most important vegetable after tomato (AVRDC, 1989) [6]. It may be used as cooked or raw salad. The leaves are also consumed as salad, soups or eaten with rice (Lovelock, 1973) [13]. The high market value of this crop attributes to good export market; however, the supply is inadequate due to low productivity of crop (Sezen *et al.*, 2006) [14].

In order to achieve high yield in pepper, there is need to augment the nutrient status of the soil to meet the crop's needs and thereby maintaining the fertility of the soil. This is achievable with adequate nutrients in the soil and their proper management (Tittone *et al.*, 2008; Adebayo *et al.*, 2009) [1].

Very few attempts have been made to work out optimum fertilizer schedules for capsicum especially under protected condition in North East India. The fertilizer rate was reported to influence quantity and quality of capsicum which imparts in ascorbic acid content and capsanthin content (Khan *et al.*, 2010) [12]. It is a well-established fact that macro nutrients such as nitrogen, phosphorus and potassium have profound effect on crop productivity and quality. An efficient and economic use of nutrients ultimately helps in decreasing the input costs for

raising a good yield (Sharma, 2016) [15]. The present investigation was conducted to study the effect of NPK on quality parameters of capsicum under protected cultivation in Northeast India conditions

Materials and Methods

The experiment was carried out at polyhouse complex of College of Horticulture and Forestry, Central Agricultural University, Pasighat-791102, Arunachal Pradesh. The geographical location of the research field is 28° 04' N latitude and 95° 22' E longitude and having an altitude of 153 m above mean sea level. The climate of this area is generally humid sub-tropical.

The experiment was laid out in factorial Randomized Block Design with 8 treatments which were replicated 3 times. Capsicum variety was taken up as the first factor *i.e.*, V₁-Asha (green var.) and V₂-Bomby (red var.) and second factor was NPK (19:19:19) levels *viz.* T₁-NPK@250 kg/ha, T₂-NPK@300 kg/ha, T₃-NPK@350 kg/ha and T₄-NPK@400 kg/ha. The plants were planted at spacing of 60 cm x 60 cm. The water soluble fertilizers were applied in the drip system. The statistical analysis for the present work was carried out by the procedure suggested by Gomez and Gomez, (2010) [11] and online software OPSTAT and WASP 0.2.

Table 1: Treatment details

S. no.	Combination	Treatments
1	T ₁ V ₁	NPK (19:19:19) @ 250 kg/ha on variety Asha
2	T ₂ V ₁	NPK (19:19:19) @ 300 kg/ha on variety Asha
3	T ₃ V ₁	NPK (19:19:19) @ 350 kg/ha on variety Asha
4	T ₄ V ₁	NPK (19:19:19) @ 400 kg/ha on variety Asha
5	T ₁ V ₂	NPK (19:19:19) @ 250 kg/ha on variety Bomby
6	T ₂ V ₂	NPK (19:19:19) @ 300 kg/ha on variety Bomby
7	T ₃ V ₂	NPK (19:19:19) @ 350 kg/ha on variety Bomby
8	T ₄ V ₂	NPK (19:19:19) @ 400 kg/ha on variety Bomby

Result and Discussion

The quality parameters were significantly influenced by the effect of different NPK levels applied. The higher total carotenoids was obtained from var. Bomby (4.30 mg/100gm) and also highest total carotenoids content was obtained from T₄ (4.12 mg/100gm). Among the interactions the highest total carotenoids was obtained from T₄V₂ (4.69 mg/100gm) while the lowest was obtained in interaction T₁V₁ (2.40 mg/100gm). The higher levels of fertigation and irrigation gave more values than lower levels in Syngenta red and Syngenta yellow variety of capsicum (Biwalkar *et al.*, 2015) [8]. Application of 100% recommended N and K (120:60 kg/ha) as fertigation improved the growth, yield and quality of the crop with highest cost benefit ratio by 1:1.72 (Brahma *et al.*, 2010) [9].

The higher ascorbic acid was recorded from var. Bomby (139.74 mg/100gm) and highest ascorbic acid content was recorded from T₄ (140.79 mg/100gm). Among the interactions the highest ascorbic acid was recorded from T₄V₂ (145.84 mg/100gm) while the lowest was obtained in interaction T₁V₁ (126.84 mg/100gm). The higher doses of NPK levels results in more ascorbic acid content. Similar report was obtained from Bassiony *et al.* (2010) [7] on sweet pepper plant. This may be due to available soluble nutrients present in the soil throughout the active growing period.

The higher chlorophyll pigment was observed in var. Asha (1.81 mg/gm) and also highest chlorophyll content was observed in T₄ (1.36 mg/gm). Among the interactions the highest chlorophyll content was observed from T₄V₁ (1.92

mg/gm) and T₃V₁ (1.92 mg/gm) respectively while the lowest was obtained in interaction T₁V₂ (0.42 mg/gm).

The higher chlorophyll content in fruits with NPK treatment @400 kg/ha may be due to higher availability of nutrients in the soil rendering better vegetative growth and flowering of crops, similar report was given by Aminifard *et al.* (2012) [3] on sweet pepper crop. The higher nutrient doses may provides high quality contents of crops such as ascorbic acid, amino acids, protein etc. The similar result was obtained by Takebe *et al.* (1995) [17] on spinach and Kamatsuna and Tei *et al.* (2000) [18] on lettuce leaves.

Table 2: Effect of varieties and NPK levels on total carotenoids (mg/100 g)

Factors	V ₁	V ₂	Mean (T)
T ₁	2.40	3.91	3.16
T ₂	2.57	3.98	3.28
T ₃	3.18	4.61	3.67
T ₄	3.54	4.69	3.92
Mean (V)	2.92	4.30	
	SEd±	C.D. 5%	
Effect of T	0.15	0.31	
Effect of V	0.15	0.31	
TxV Interaction	0.30	0.61	

Table 3: Effect of varieties and NPK levels on ascorbic acid (mg/100g gm)

Factors	V ₁	V ₂	Mean (T)
T ₁	126.84	135.65	131.25
T ₂	127.76	136.84	132.30
T ₃	132.51	140.62	136.57
T ₄	135.74	145.84	140.79
Mean (V)	130.71	139.74	
	SEd±	C.D. 5%	
Effect of T	2.02	4.14	
Effect of V	2.02	4.14	
TxV Interaction	4.03	NS	

Table 4: Effect of varieties and NPK levels on chlorophyll content (mg/gm)

Factors	V ₁	V ₂	Mean (T)
T ₁	1.64	0.42	1.03
T ₂	1.77	0.48	1.13
T ₃	1.92	0.49	1.19
T ₄	1.92	0.79	1.36
Mean (V)	1.81	0.55	
	SEd±	C.D. 5%	
Effect of T	0.06	0.12	
Effect of V	0.06	0.12	
TxV Interaction	0.12	NS	



Fig 1: Asha variety



Fig 2: Bomby variety

Conclusion

On the basis of the result obtained, it can be concluded that the quality of capsicum crops are highly influenced by the doses of NPK fertilizers to great extent and there by the overall improvement in quality yield. Hence for obtaining good quality capsicum an dose of NPK (19:19:19) @ 400kg/ha is to be applied for cultivation of capsicum under protected cultivation

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