Plant Archives Vol. 16 No. 2, 2016 pp. 931-933 *ISSN 0972-5210*

COMPARATIVE STUDY OF DIFFERENT CAPSICUM VARIETIES UNDER OPEN AND PROTECTED CONDITIONS

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Abstract

The comparative study of different capsicum genotypes was conducted at Agril. Research Station, Palghar, Dist. Palghar, Maharashtra state under two environmental conditions *viz*; poly house and open field. Under protected conditions, Manhattan variety recorded maximum plant height (78.44 cm) followed by California Wonder. However, in open conditions, California Wonder recorded significantly maximum height (51.30 cm) followed in Aishwarya. Under poly house conditions, the maximum fruit weight (76.48 g) was reported in Orobelle hybrid followed by Manhattan while other varieties were at par to each other. Under open field conditions, Manhattan recorded maximum (60.84 g) fruit weight which was at par with California Wonder. Under poly house conditions, Orobelle recorded maximum increase (41.85 per cent) in the fruit size compared to open conditions. The fruit yield per plant was recorded maximum (2.426 kg plant^{-1}) by California Wonder under polyhouse which was on par with Orobelle. The incidence of thrips was significantly reduced by 41.44 per cent in protected conditions (Poly house) than open conditions. However, the incidence was not significantly varied among the hybrids/varieties under both the environmental conditions.

Key words : *Capsicum (Capsicum annuum* L.*),* Poly house, open field, yield.

Introduction

The Capsicum (*Capsicum annuum* L.), commonly known as sweet pepper or bell pepper occupies the prominent position among the green vegetables because of its export value. It is one of the highly remunerative vegetable cultivated in most parts of the world. Its cultivation under protected conditions is becoming popular in recent years due to increased productivity and high quality produce. For protected cultivation, different structures are being used depending upon the local environmental conditions. There are several indeterminate capsicum hybrids, which are much suited for protected cultivation and the plant spatial arrangement is one of the crop management practices that have been used to increase yield of sweet pepper per unit area in greenhouse (Cebula, 1995). The local environmental conditions, season, type of protected structures used for capsicum cultivation may require different crop management practices. This crop is not only advanced but an increase in the yield is also obtained due to extending cropping period than their traditional method of crop production (Kumar *et al.* 2005). The scenario of insect pests under protected cultivation is vastly different compared to the pest problems under open field (Jhansi Rani and Eswara Reddy, S.G. *et al.* 2001). The incidence of sucking pest and wilt disease is also more in capsicum and the level of incidence is also governed by different growing conditions. Considering the available resources, there is enormous scope for cultivation of this crop in north konkan agroclinmatic conditions. The present study was undertaken to evaluate the yield of different capsicum genotypes grown under different growing conditions *viz*; poly house and open field.

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Material and methods

The experiment was conducted at Agril. Research Station, Dist. Palghar, Maharashtra state during *rabi* seasons of 2008-09 in two environment conditions as in poly house and in open field. The location is under north konkan coastal agroclimatic zone. The experiment was laid out in a randomized block design with four replications. The treatments included six varieties/hybrids of capsicum *viz*; Bomby (red fruits), Aishwarya,

Manhattan, Orobelle (yellow fruits), Indra (green fruits) and California wonder. The preparatory tillage operations were carried out for land preparation. Six weeks old seedlings were used for transplanting. The transplanting was done in first week of November at 45 cm × 45 cm spacing in paired row zigzag planting system on raised bed. The planting density was 4.90 plants per square meter. In poly house stretchable shading net was provided inside and was used when ever required. Under protected condition, the plants were trained along a plastic thread tied to GI wire stretched over headlong beds. The essential recommended cultural practices like fertilizer application, irrigation, weeding, etc. were carried out in both conditions. The four plants from each treatment were randomly selected for recording observations on plant height, average fruit weight, fruit yield per plant and yield per square meter and per hectare. Observations on pest population of thrips, *Scirtothrips dorsalis* (Hood) were recorded by destructive sampling by taking count on number of insects per 5 leaves from four randomly selected plants. The data were statistically analyzed by the method suggested by Panse and Sukhatme (1985).

Results and discussion

The data on performance of different capsicum varieties/hybrids in respect of plant growth, average fruit weight and yield under poly house condition and open field condition are given in table 1 and table 2.

It is evidence from table 1 that the plant height and average fruit weight of capsicum was significantly superior in protected conditions (Poly house) in comparison to the open field conditions. Under protected conditions, Manhattan variety recorded maximum plant height (78.44 cm) followed by California Wonder. However, in open conditions, California Wonder recorded significantly maximum height (51.30 cm) followed in Aishwarya. These results are in conformity with the findings of Sharma et.al. (2010).

The fruit weight is an important quality parameter and the same was recorded higher in polyhouse conditions than open field conditions. Under poly house conditions, the maximum fruit weight (76.48 g) was reported in Orobelle hybrid followed by Manhattan while remaining were at par to each other. Under open field conditions, Manhattan recorded maximum (60.84 g) fruit weight which was at par with California Wonder. Under poly house conditions, Orobelle recorded maximum increase (41.85 per cent) in the fruit size compared to open conditions that means this hybrid might be sensitive to environmental conditions. Increased fruit weight may be attributed to the favorable microclimate that prevailed in the polyhouse compared to other structures. In California Wonder variety, improvement in fruit weight by 6.29 per cent. Similar observations were recorded by Naik (2005) in capsicum grown under protected conditions.

The data on the yield of the different varieties/hybrids were given in tables 1 and 2. The fruit yield per plant was recorded maximum (2.426 kg plant^{-1}) by California Wonder under polyhouse which was on par with Orobelle. As the average weight of the fruit was maximum in Orobelle hybrid but there was less bearing of fruits per

Table 1 : Effect of environment conditions on Growth and yield performance of different capsicum varieties/hybrids

Sr. No.	Variety/ Hybrid	Plant height (cm)		Average fruit weight (g)			Average Yield per plant (kg)		
		PC	OF	PC	OF	Percent increase over open field	PC	OF	Percent increase over open field
1.	Bomby	69.00	44.94	65.51	54.18	20.99	1.815	1.564	16.07
2.	Aishwarya	71.75	49.63	61.55	51.76	18.91	2.039	1.555	31.11
3.	Manhattan	78.44	47.13	68.66	60.84	12.86	1.920	1.729	20.93
4.	Orobelle	66.82	45.94	76.48	53.91	41.85	2.384	1.588	37.14
5.	Indra	73.38	46.88	63.31	51.88	22.05	1.990	1.608	23.74
6.	California Wonder	76.00	51.30	63.19	59.45	6.29	2.426	1.729	40.30
	Mean	72.56	47.63	66.45	55.34	20.48	2.096	1.630	28.22
	SE±	1.621	1.156	0.999	0.449	-	0.332	0.021	-
	C.D. at 5%	4.884	5.16	3.010	1.353	-	0.681	0.064	-
	Paired t Test	16.53*		4.32*		-	6.43*		-

(PC : Protected conditions (Poly house), OF : Open field) (* Significant at 5.0 %)

Table 2 : Effect of environment conditions on yield of different capsicum varieties/hybrids

Sr. No.	Variety/ Hybrid	Protected conditions (Poly house)		Open field	
		Average Yield (kg m^{-1})	Avg. Yield (Q ha^{-1})	Average Yield (kg m^{-1})	Avg. Yield (Q ha^{-1})
1.	Bomby	8.96	899.01	7.72	767.04
2.	Aishwarya	10.07	1009.75	7.68	766.42
3.	Manhattan	9.48	946.17	8.54	840.93
4.	Orobelle	11.98	1116.42	7.84	790.37
5.	Indra	9.83	985.25	7.94	838.27
6.	California Wonder	11.77	1169.82	8.59	867.96
	SE±	0.16	26.06	0.10	17.6
	C.D. at 5%	0.49	79.75	0.31	50.84

Table 3 : Effect of environment conditions on incidence of thrips in different capsicum varieties/hybrids.

Sr. No.	Variety/ Hybrid	Mean number of thrips /5leaves		Percent reduction in thrips incidence over open field
		Protected conditions (Poly house)	Open field	
1.	Bomby	7.38 (15.75)#	12.33 (20.52)	40.15
2.	Aishwarya	8.08 (16.51)	12.94 (21.03)	37.56
3.	Manhattan	7.25 (15.60)	11.49 (19.77)	36.90
4.	Orobelle	7.13 (15.47)	13.13 (21.23)	45.70
5.	Indra	6.23 (14.31)	11.83 (20.09)	47.34
6.	California Wonder	6.88 (15.16)	11.55 (19.87)	40.43
	Mean	7.15 (15.46)	12.21 (20.42)	41.44
	SE±	0.69	0.58	
	C.D. at 5%	NS	NS	
	Paired t Test	18.15*		

(# Figures in parenthesis are arcsine values)
(* Significant at 5.0 %)

plant, leads to slightly low yield compared to California Wonder variety. Increased yield per plant under protected conditions was due to favourable microclimate for growth and development of the plant and results were also reported by Nagendra Prasad (2001) in capsicum. However under open field conditions, California Wonder reported highest yield which was on par with Manhattan and Indra. The same trend was reflected in yield per unit area. A both growing conditions compared, the maximum increased yield was recorded California Wonder (40.30 per cent) followed by Orobelle (37.14 per cent), Aishwarya (31.11 per cent), that means these varieties/ hybrids might be sensitive for environmental conditions. This difference in fruit yield per plant in capsicum might be due to the inherent characters of the individual hybrids.

The data on thrips incidence is given in table 3. The incidence of thrips was significantly reduced by 41.44 per cent in protected conditions (Poly house) than open conditions. However, the incidence was not significantly varied among the hybrids/varieties under both the environmental conditions. Eswara Reddy and Krishna kumar (2006) reported that thrips was serious pest of sweet pepper under both protected and open field conditions.

Thus the cultivation of different capsicum varieties in poly house is very advantageous as the fruit weight and size, comparatively less incidence of pest, yield levels were increase by many fold, resulting in high monetary returns, quality production and also the off season production.

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