

Performance of coloured capsicum hybrids under different protected structures

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Abstract: Capsicum hybrids viz., Orobelle, Bomby and Indra were grown under naturally ventilated polyhouse (NVP), naturally ventilated shadow hall, shadehouse with misting and shadehouse without misting during summer 2007 at Hi-Tech Unit, Department of Horticulture, Agricultural College, Dharwad. Planting was done in two rows on 1m wide beds leaving 50 cm path between two beds following the spacing of 45 x 60 cm. The data were analyzed statistically by using three factorial strip plot design. The results revealed that the earliest flower initiation (33.00 days), least time taken for first harvesting (86.00 days) and highest per cent fruit set (49.81) were recorded under NVP. The hybrid Indra recorded significantly earliest flower initiation (35.42 days), lower time taken for first harvesting (86.00 day) and higher per cent, fruit set (45.45) as compared to other two hybrids. The quality parameters like fruit weight (160.00 g), fruit volume (320.00 cc), rind thickness (0.91 cm) and shelf life (8.62 days) were also significantly maximum under naturally ventilated polyhouse than under naturally ventilated shadowhall. Among the hybrids, Bomby recorded significantly higher fruit weight (158.50 g), fruit volume (310.00 cc) and Indra recorded higher rind thickness (0.87 cm) and shelf life (8.60 days).

Key words : Capsicum, growing structures, hybrids

Introduction

Capsicum (*Capsicum annum* L. var. *grossum* Sendt.) attained a status of high value 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 and other vitamins and minerals. Capsicum fetches high price in market, mainly due to heavy demand from urban consumers. There is a good demand for export also. The export market needs fruits with longer shelf life, medium size tetralobed fruits with attractive colour, mild pungency with good taste. However, the supply is inadequate due to the low productivity of the crop (Muthukrishnan *et al.*, 1986).

The crop grown under open conditions will not fulfill the export standards, so the search for new avenues has led to development of Hi-Tech precision agricultural systems. Greenhouse, the latest world in Indian agriculture is one such means, where the plants are grown under controlled or partially controlled environment resulting in higher yields than that possible under open conditions (Navale *et al.*, 2003) in capsicum.

Protected structure is created locally by using different types of material. These structures are designed as per climatic requirements of the area for different sets of environmental conditions. Growing of capsicums under cover has been reported to give good quality produce with higher productivity in several countries. Recently, few entrepreneurs have started its cultivation under protected conditions like greenhouse, shade house etc. to get higher productivity and quality adopting the hybrids supplied by the private companies. Now a days apart from green colour, other varieties like red, yellow, light green are also

available. However, there is a need to assess the performance of capsicum hybrids under different structures.

Material and methods

The experiment was conducted under naturally ventilated polyhouse (S₁), naturally ventilated shadowhall (S₂), shadehouse with misting (S₃) and shadehouse without misting (S₄) facilities at Hi-Tech Horticulture Unit of the Main Agriculture Research Station, Saidapur Farm, University of Agricultural Sciences, Dharwad during the month from February to August, 2007.

The seedlings of capsicum hybrids cv. Orobelle, Bomby and Indra were planted in two rows on one meter wide bed having 50 cm path between two beds and the spacing maintained was 45 cm x 60 cm. Plants were trained along a plastic thread tied to galvanised iron wire stretched over head along the bed. The experiment was laid out in a three factor strip plot design with three replications. The total number of treatments were twelve. Irrigation and fertigation were done as per the recommendations. The misting was carried out by overhead mister in summer month to bring temperature and relative humidity upto optimum level under both polyhouse and shadehouse conditions.

The observations were recorded on reproductive parameters like number of flowers per plant, number of fruits per plant, time taken for flower initiation, per cent fruit set, time taken for first harvestings etc. and quality parameters like fruit weight (g), fruit volume (cc), rind thickness (cm) and shelf life (days). For shelf life (days), fruits were kept in ambient conditions and the number of days were counted until they remained fresh and at acceptable quality.

Results and discussion

All the reproductive parameters differed significantly due to growing structures and hybrids. The number of flowers and fruits per plant was higher under NVP at all stages of crop growth viz., 60, 90, 120 and 150 DAP (days after planting). The maximum (12.44 and 11.66) number of flowers and fruits were recorded under NVP than shadowhall at 120 DAP, respectively.

Among the hybrids, the Indra recorded maximum (number of flowers and fruits 13.41 and 12.11 respectively) at 120 DAP. This might be due to the favourable climatic conditions coupled with faster growth, higher number of secondary branches, sufficient accumulation of photosynthates and less of flower dropping inside the polyhouse as compared to shadow hall. Similar findings were recorded by Bhatt and Rao (1993).

The least less time taken for flower initiation (33.00) and that for first harvest (86.00) were recorded under NVP than

shadowhall. Among the hybrids, the Indra recorded comparatively early flower initiation (35.42), time taken for first harvest (86.00) days. The maximum (49.81%) fruit set was recorded under NVP than under shadowhall (32.76%). Among the hybrids, the maximum fruit set (45.45) was recorded by Indra. This might be due to good vegetative growth besides effective pollination and fertilization and lower abscission rate of flowers. Similar results were recorded by Backer (1989) in sweet pepper.

All the quality parameters differed significantly due to the effect of growing structures and hybrids. The weight and volume of fruit play an important role in increasing the total yield in capsicum. The weight and volume of the fruits grown under NVP were higher (160.00 g and 320.00 cc) as compared to shadowhall structure. This was largely due to the increased length and breadth of fruit.

The maximum fruit weight and fruit volume (158.50 g and 310.00 cc) were recorded by the hybrid Bomby. This could

Table 1. Number of flowers and fruits per plant as influenced by growing structures and hybrids at different stages of crop growth in capsicum

Treatment	Number of flowers per plant				Number of fruits per plant			
	Days after planting							
	60	90	120	150	60	90	120	150
A. Growing structure								
S ₁ – Polyhouse	7.61	11.88	12.44	6.72	7.11	10.88	11.66	4.50
S ₂ – Shadow hall	3.83	7.88	10.22	5.61	3.27	6.05	9.20	3.02
S ₃ – Shade house with misting	6.55	10.72	11.55	6.66	6.05	9.44	10.13	4.33
S ₄ – Shade house without misting	6.16	10.22	11.10	6.05	5.16	9.11	10.05	3.88
S.Em ±	0.156	0.169	0.182	0.146	0.053	0.102	0.123	0.082
CD (P=0.05)	0.539	0.584	0.629	0.505	0.183	0.352	0.425	0.283
B. Hybrid								
H ₁ – Orobelles (yellow)	5.82	10.12	11.45	6.50	5.00	9.83	10.00	4.00
H ₂ – Bomby (red)	5.20	8.83	10.87	5.62	4.70	7.29	9.78	3.00
H ₃ – Indra (green)	7.04	11.58	13.41	6.66	6.54	10.79	12.11	4.12
S.Em ±	0.221	0.063	0.091	0.055	0.116	0.081	0.117	0.151
CD (P=0.05)	0.863	0.247	0.357	0.215	0.455	0.318	0.459	0.592
C. Interaction								
S ₁ H ₁	6.83	11.00	12.66	6.33	6.15	10.00	11.83	4.00
S ₁ H ₂	6.00	11.12	10.00	6.35	6.16	9.33	11.00	4.12
S ₁ H ₃	9.00	13.66	14.66	7.33	8.16	11.33	12.33	5.00
S ₂ H ₁	3.66	8.00	10.20	5.66	3.33	7.50	10.00	2.13
S ₂ H ₂	2.83	6.50	8.83	5.00	2.16	5.33	8.00	2.65
S ₂ H ₃	5.16	9.16	10.00	6.16	4.33	8.33	10.11	3.50
S ₃ H ₁	7.16	11.50	11.60	7.16	7.00	9.50	11.43	4.00
S ₃ H ₂	5.00	8.83	14.33	6.00	6.15	7.51	12.00	3.16
S ₃ H ₃	6.13	11.83	11.00	7.00	6.10	11.33	11.16	4.50
S ₄ H ₁	6.16	10.00	10.66	6.83	5.83	8.33	11.12	3.06
S ₄ H ₂	7.00	9.00	11.60	5.16	6.16	7.00	11.21	2.41
S ₄ H ₃	6.15	9.12	10.20	6.16	5.32	10.16	12.11	3.50
S.Em ±	0.277	0.356	0.857	0.181	0.347	0.226	0.223	0.320
CD (P=0.05)	0.853	0.961	2.640	0.557	1.069	0.696	0.687	0.986

Table 2. Time taken for different growth attributes and per cent fruit set as influenced by growing structures and hybrids in capsicum

Treatments	Time taken for flower initiation (days)	Time taken for first harvest (days)	Per cent fruit set
A. Growing structure			
S ₁ – Polyhouse	33.00	86.00	49.81
S ₂ – Shadow hall	40.68	87.22	32.76
S ₃ – Shade house with misting	35.95	86.33	47.03
S ₄ – Shade house without misting	36.50	86.55	43.70
S.Em ±	0.141	0.262	0.645
CD (P=0.05)	0.487	0.908	2.231
B. Hybrid			
H ₁ – Orobelle (yellow)	38.40	87.08	42.36
H ₂ – Bomby (red)	36.20	86.50	41.17
H ₃ – Indra (green)	35.42	86.00	45.45
SE m+	0.110	0.201	0.663
CD (P=0.05)	0.396	0.425	2.603
C. Interaction			
S ₁ H ₁	39.00	87.00	47.81
S ₁ H ₂	38.10	87.23	47.86
S ₁ H ₃	30.66	85.33	52.75
S ₂ H ₁	43.06	89.00	35.23
S ₂ H ₂	34.83	86.33	29.91
S ₂ H ₃	40.00	81.33	33.14
S ₃ H ₁	38.19	86.20	49.81
S ₃ H ₂	33.66	86.00	45.36
S ₃ H ₃	35.03	86.66	47.80
S ₄ H ₁	34.66	86.10	44.02
S ₄ H ₂	41.00	88.13	48.81
S ₄ H ₃	37.00	86.73	41.01
S.Em ±	0.247	0.286	1.437
CD (P=0.05)	0.761	0.881	3.312

Table 3. Quality parameters as influenced by growing structures and hybrids in capsicum

Treatment	Fruit weight (g)	Fruit volume (cc)	Rind thickness (cm)	Shelf life(days)
A. Growing structure				
S ₁ – Polyhouse	160.00	320.00	0.91	8.62
S ₂ – Shadow hall	135.80	241.00	0.74	8.00
S ₃ – Shade house with misting	152.00	295.00	0.85	8.30
S ₄ – Shade house without misting	148.50	287.50	0.80	8.07
S.Em ±	0.196	0.636	0.045	0.084
CD (P=0.05)	0.678	2.200	0.179	0.290
B. Hybrid				
H ₁ – Orobelle (yellow)	150.00	300.00	0.72	7.97
H ₂ – Bomby (red)	158.50	310.00	0.84	8.17
H ₃ – Indra (green)	147.50	289.00	0.87	8.60
S.Em ±	0.146	0.524	0.382	0.077
CD (P=0.05)	0.573	2.057	NS	0.302
C. Interaction				
S ₁ H ₁	172.10	344.20	0.88	8.36
S ₁ H ₂	173.00	346.00	0.91	8.50
S ₁ H ₃	170.00	334.00	0.95	9.01
S ₂ H ₁	167.00	324.00	0.74	7.63
S ₂ H ₂	165.23	284.00	0.73	7.70
S ₂ H ₃	130.62	260.24	0.82	7.83
S ₃ H ₁	145.61	290.22	0.51	8.08
S ₃ H ₂	170.23	240.46	0.87	8.40
S ₃ H ₃	155.11	288.52	0.90	8.41
S ₄ H ₁	149.36	260.46	0.83	8.68
S ₄ H ₂	132.11	264.22	0.85	8.08
S ₄ H ₃	158.50	276.10	0.86	8.32
S.Em ±	1.373	1.418	0.773	0.11
CD (P=0.05)	4.229	4.367	NS	0.342

NS – Non-significant

be due to high uptake of nutrients and build up of sufficient photosynthates enabling the increase in size of fruits (length and breadth), resulting in the increased fruit weight and volume in that hybrid. Similar findings were recorded by Buitelaar and Janse (1987) in tomato and Mohamedien *et al.*, (1991) in cucumber. The higher rind thickness (0.91 cm) was observed under NVP than shadowhall (0.74 cm). There was no significant difference among hybrids and interaction between growing conditions and hybrids with respect to rind thickness. However, it was found to be higher in Indra (0.87 cm) and in polyhouse x Indra interaction (0.95 cm).

The shelf life of capsicum is also an important quality parameter because it directly influences the market distance.

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- Among the different growing environments the naturally ventilated polyhouse (NVP) recorded the highest total marketable fruit yield with more number of excellent quality export grade fruits. The capsicum cv. Indra gave a tremendous response to different growing structures. Instead of rainy season this cultivar can be grown very well in shade house structure. For common farmers the practice of growing capsicum cv. Indra under shade house structure will be more profitable.
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