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PERFORMANCE OF SWEET PEPPER UNDER PROTECTIVE STRUCTURE IN GAZIPUR OF BANGLADESH

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Abstract

Evaluation of sweet pepper cultivation under different protective structures was made in two consecutive seasons of 2007-08 and 2008-09 at the experimental field of Horticulture Research Center of BARI, Gazipur. One popular commercial capsicum variety California Wonder was included in the study with four protective structures (low height poly tunnel, polytunnel with side open, poly tunnel with side closed and poly house) including control (open field). Protective structures had remarkable and significant influence on plant growth and yield of sweet pepper. The plants grown under protective structures had higher plant height compared to that of plants grown in open field. The highest individual fruit weight (65.2g) was recorded form the plants grown under poly house condition while it was the lowest from open field grown plant (3.34 g). More than five fruits were harvested when the plants were grown under poly tunnel (side closed) or poly house. The maximum fruit yield per plant (334.0g) was recorded from poly house, which was 160.4% higher than that of plants grown under open field condition. The second highest yield was recorded from the plants of poly tunnel (212.5) indicating bright scope for sweet pepper cultivation under protective structures.

Key Words: Sweet pepper, protective structure, poly tunnel, open field

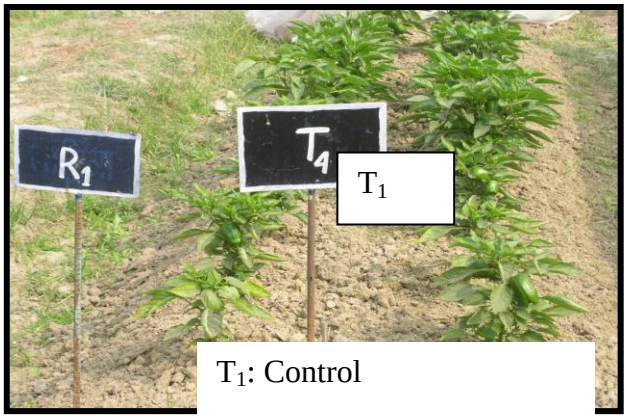
Introduction

Sweet pepper (*Capsicum annuum* L) is one of the most important vegetable crops grown extensively throughout the world especially in the temperate countries. The crop is very sensitive to environmental factors (Bhatt et al., 1992). Owing to its sensitivity, its yield is affected significantly. Capsicum is the most important summer crop of temperate regions but now a days efforts are being made to grow sweet pepper in Bangladesh (Paul, 2009). Some advanced farmers grow capsicum sporadically to meet the demand of the periphery of Dhaka city (Saha and Salam, 2004). Its production is in Bangladesh is largely affected due high infestation of mite and low night temperature. (Anon, 2008). The optimum temperature requirement for sweet pepper growth ranged from 16-25^0 C. High night temperature is more

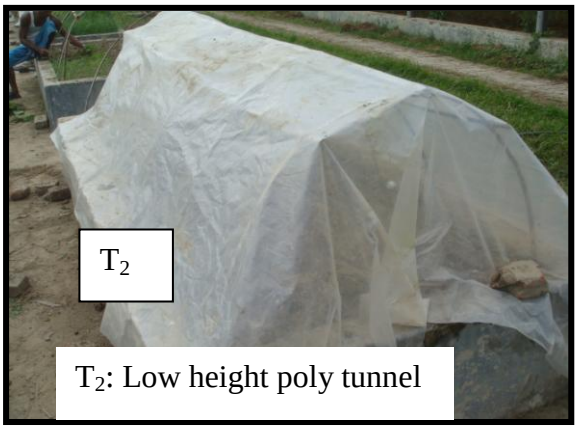
detrimental to fruit set than day temperature (Rylski and Spigelman, 1982). Again night temperature below 16^0C and day temperature above 32^0C also causes blossom dropping (Boswell, 1964). In Bangladesh, from December to January during vegetative and fruiting stage of the crop, night temperature is gradually decreased below 10^0C or less. In that situation vegetative and reproductive stage of capsicum plants become ceased or stunted, fruit and flower drops may occur. So for proper growth and yield of capsicum at low temperature under netted poly tunnel or poly house may be effective because it protected the plants from pest infestation and from cold injury since night temperature inside poly covers raises higher than outside. However, information regarding use of protective structures for capsicum production in Bangladesh is very scanty. Therefore, the present investigation was undertaken to study the effect of protective structures on the growth and yield of capsicum.

Materials and Methods

The study was conducted at Olericulture division, HRC, BARI Gazipur, during rabi season of two consecutive years of 2006-07 and 2007-08. The study was set up in RCB design with four replications. One popular commercial capsicum variety California Wonder was included in the study with four protective structures including control (T_1=open field, T_2=low height poly tunnel having 2.0 feet height in the middle, T_3= polytunnel having 6.0 feet height in the middle in which side of the tunnel remain open, T_4=poly tunnel having 6.0 feet height in the middle in which side of the tunnel remain closed by polythene and T_5=poly house). Photograph of the treatments are presented in Figure 1.



T_1: Control



T_2: Low height poly tunnel

T_3: Poly tunnel (side open)

T_4: Poly tunnel (side closed)

T_5: Poly house

Figure1. Photographs of different treatments

The seeds were sown in seedbed on October 17 in both of the year 2006 and 2007. Seedlings of 2-3 leaf stage were transplanted to poly bags. Thirty five days old seedlings (4-5 true leaf stage) were transplanted in the experimental plots. The unit plot size was 4.0 x 2.0 m and the plants were spaced 50 x 40 cm between plant-to-plant and row-to-row, respectively. The crop was fertilized with cow dung, urea, TSP, MP, Gypsum and ZnO at the rate of 10 ton, 220kg, 330 kg 200 kg 110 kg and 5 kg per hectare, respectively. Half of the quantity of cow dung was applied at final land preparation. The remaining cow dung, entire quantity of TSP, ZnO,

Gypsum and one third each of urea and MP were applied during pit preparation. The rest of urea and MP were applied in two equal splits at 25 and 50 days after transplanting in the main field. Irrigation, weeding and mulching were done as required. Data were recorded on yield and yield attributes and analysed using MSTAT software for interpretation of results.

Results and Discussion

Main effect of protective structure

Significant variation was observed among the different structures for all the parameters studied (Table 1). Days required to flower was the earliest (59.0days) for the plants when grown in open field Conditions. The plants grown under poly tunnel (T_4=side closed) required maximum days (65.5 days), which was at par with the plants grown in poly house (64.90 days). The variation in days to first flower between open field and protective structures might be attributed due to the congenial atmosphere prevailed in protective structures which encouraged the plants for more vegetative growth. This statement is clearly reflected in the plant growth when grown in protective structures. The highest plant height was recorded from the plants (51.58cm) when grown under poly house while it was the lowest in open field condition (39.10 cm). Low night temperature and other biotic and abiotic stresses in the open field were responsible for low plant growth. Boswell (1964) opined that low night temperature is very detrimental for growth of sweet pepper. Again the highest number of fruits per plant was recorded from the crop grown under poly house (5.12) followed by side closed polytunnel (5.20). Not only that, individual fruit weight, fruit length, and fruit breadth also the highest for the crop when grown under poly house. The heaviest individual fruit weight (65.20 g) was recorded from poly house grown plant while it was only 38.87 g when grown in open field. The highest fruit yield per plant was obtained from the poly house crop (334.6g/plant) where as it was only 128.5 g form the plants of open field. From the above discussion it is clear that protective structure is a prerequisite for successful capsicum production under Bangladesh condition. Protective structures provide congenial atmospheric conditions and also protected the crops from pests. Again structures were found more effective because at night, capsicum plants covered with polythene sheet prevent the crop form cold injury and enhance proper growth and development. Table 4 was also supported that the minimum temperature under protective structures was 2-3^{0}C higher than that of open field temperature. The increased temperature in protective structure compared to open field favors proper growth of the plant under protective structure condition. Specially, the minimum temperature from 15 December to 15 January in protective structure was

around 14^{o}C while it was around 11^{o}C in the open field condition (Table 4). This temperature variation might be the cause of yield variation between open field and protective structure. Not only that shade can improve yield or sweet pepper (El-Aidy *et al*., 1989). Wien *et al*. (1989) concluded that a little shade in the tropics might benefit pepper growth. Under this study, protective structures protect the plants from direct sun, which ultimately influence plant growth and yield.

Interaction between year and protective structures

Interaction effect between protective structures and year for different parameters was presented in Table 2. Days to first flower was varied from 60 to 68.5 days. Plants those were grown under protective structures exhibited delayed flowering. Maximum plant height was also recorded from the plants of protective structures in both of the years (107.2cm and 95.3 cm, respectively). The highest individual fruit weight was observed in 1st year when plants were grown under poly house (67.33g). Similar trend was also observed for the 2nd year crop when grown under poly tunnel (63.17g). The higher individual fruit weight might be attributed due to better vegetative growth of the plants grown under poly house. The highest number fruits per plant was recorded in first year crop when grown side closed poly tunnel (7.39) closely followed by poly house (6.42). Similarly in 2nd year crop, higher number of fruits was harvested from the plants grown in poly house and side closed poly tunnel. In respect of fruit yield per plant, protective structures like poly house and side closed poly tunnel provided higher amount of fruit per plant. In first year, the highest fruit yield per plant was recorded from the plant of poly house (431.6g) followed by side closed poly tunnel plants (308.0g). In both of the year, the lowest yield was recorded from open field plant. Paul (2009) opined that use of poly-shade and shade nets are very much effective for sweet pepper production in Bangladesh. Again Paul (2009) recorded better marketable yield when the crop was provided with partial shading.

Mean effect of year

Yearly variation as regard to yield and yield parameters of sweet pepper is presented in Table 3. Most of parameters were significantly higher for 1st year crop. Fruit yield per plant was much higher in 1st year (286.42.3) compared to that of 2nd year crop (136.40). This indicates that sweet pepper is very much sensitive to environment.

For two years investigation result suggested that sweet pepper production under Bangladesh condition is possible provided the crop is protected from biotic and a biotic

stresses. Protection of plants from low night temperature during heavy cold, protraction of the plants from mite and insects are the prime prerequisite for successful capsicum production in Bangladesh

Table 1. Yield and yield components of sweet pepper under different protective structures (Pooled over means of two years)

Treatment	Days to flower	Days to harvest	Plant height (cm)	Fruit length (cm)	Fruit breadth (cm)	Individual fruit weight (g)	Number of fruit/ plant	Fruit yield/ plant (g)	% Yield increase
T_1	59.0 c	96.13 c	39.10 d	6.18 b	5.03 c	38.87 d	3.31 b	128.5 c	-
T_2	63.08 b	99.08 b	41.10 c	5.36 c	4.66 d	41.73 b	3.80 b	162.0 c	26.0
T_3	62.40 b	97.68 b	41.65 bc	5.36 c	5.01 c	42.10 b	3.43 b	150.4 c	16.6
T_4	65.65 a	98.08 b	42.73 b	6.18 b	5.17 b	40.03 c	5.20 a	212.5 b	65.0
T_5	64.90 a	101.3 a	51.58 a	7.23 a	6.22 a	65.30 a	5.12 a	334.6 a	160.4
F-test	**	**	**	**	**	**	**	**	

Means followed by same letter(s) in a column do not differ significantly by LSD

Where, T_1= Control (open), T_2= Low height poly tunnel, T_3=Poly tunnel (side open)

T_4= Poly tunnel (side closed), T_5=Poly house

Table 2. Interaction effect between year and protective structure on yield and yield parameters of sweet pepper

Treatment	Days to flower	Days to harvest	Plant height (cm)	Fruit length (cm)	Fruit breadth (cm)	Individual fruit weight (g)	Number of fruit/ plant	Fruit yield/ plant (g)
Year1X T_1	58.0 a	102.0 b	36.13 g	6.13	5.06	38.3 g	4.58 cd	173.5 c
Year1X T_2	65.0 b	103.2 b	34.03 h	5.26	5.02	44.13 d	5.18 c	228.2 c
Year1X T_3	62.8 c	102.3 b	40.27 ef	5.39	5.31	48.23 c	4.47 cd	214.7 c
Year1X T_4	68.3 a	102.2 b	38.30 f	6.2	5.44	42.03 e	7.34 a	308.0b
Year1X T_5	68.5 a	107.2 a	49.27 b	7.11	6.3	67.23 a	6.42 b	431.6a
Year 2X T_1	60.0 d	90.2 d	42.07 de	6.23	5.0	39.43 f	2.10 f	83.4 d
Year 2X T_2	61.1 d	95.0 c	48.17 dc	5.45	4.3	39.33 f	2.42 ef	95.8 d

Year 2X T_3	62.0 c	93.1 c	43.03 d	5.33	4.71	35.97 g	2.39 ef	86.1 d
Year 2X T_4	63.0 c	94.0 c	47.17 c	6.16	4.90	38.02 h	3.06 e	117.1 d
Year 2X T_5	61.3 cd	95.3 c	53.90 a	7.34	6.14	63.17 b	3.83 d	241.94b
F-test	**	**	**	ns	ns	**	**	**

**= Significant at 1% level of probability, ns= Not significant

Means followed by same letter(s) in a column do not differ significantly by LSD

Table 3. Yearly variation of yield and yield parameter of sweet pepper

Treatment	Days to flower	Days to harvest	Plant height (cm)	Fruit length (cm)	Fruit breadth (cm)	Individual fruit weight (g)	Number of fruit/ plant	Fruit yield/ plant (g)
Y_1	62.52	103.35	39.60	6.02	5.43	48.98	5.59	273.91
Y_2	61.49	93.54	46.86	6.10	5.01	43.18	2.76	119.17
F-test	**	**	**	**	**	**	**	**

Table 4.Fortnight temperature (^{O}C) data (outside and inside of protective structures) during cropping period of first and second year crop

Period	2007-2008			
	Maximum (^{O}C)		Minimum (^{O}C)	
	Outside	Inside	Outside	Inside
Nov 1-15	30.2	32.5	20.8	23.1
Nov 16-30	28.8	31.7	17.2	19.8
Dec 1-15	26.74	28.9	15.0	18.3
Dec 16-30	25.1	26.7	11.6	13.9
Jan 1-15	26.2	28.5	11.7	13.8
Jan 16-30	22.6	24.35	13.1	14.9
Feb 1-15	25.3	26.9	12.9	14.8
Feb 16-29	27.5	29.1	14.6	15.9

References

Anonymous. 2008. Annual Report-2008 of Olericulture Division, Horticulture Research center, BARI, Gazipur.

Bhatt, R. M.; N. K. S. Rao and N. Anand. 1992.Response of bell pepper to irradiance photosynthesis, reproductive attributes and yield. Indian J. Hort., 56(1):62-66.

Boswell, V. R. 1964. Pepper production. In: Spices, Vol 1(ed). Longman Scientific Technical, John Willy and Sons Inc. New York :p.331.

El-Aidy,F., M. El-Afry and F. Ibrahiem. 1989. The influence of shade nets on the growth and yield of sweet pepper. In: Green S. k. (ed.) tomato and pepper production in the tropics. AVRDC, Taiwan, 345-348.

Paul T. K. 2009. Technology of sweet pepper production in Bangladesh. PhD Theis. Dept of Horticulture, BSMRAU, Salna, Gazipur. p. 225.

Ryiski, I and M Spigelman. 1982. Effects of different diurnal temperature combination on fruit set of sweet pepper. Scintia Hort., 17: 359-366.

Saha, S. R. and M. A. Salam 2004. Modern techniques of sweet pepper cultivation. A booklet published by plant physiology section, HRC, BARI, Gazipur.

Wien, H. C., K. E. Tripp, A. R. Harnandez and A. d. Turner. 1989. Abscission of reproductive structures in pepper: causes, mechanism and control. In: Green S. k. (ed.) tomato and pepper production in the tropics. AVRDC, Taiwan, 150-165.