



Response of exotic gerbera under low (*Gerbera jamesonii*) cost polyhouse and shade net house in sub-tropical mid hills of Meghalaya*

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Gerbera (*Gerbera jamesonii* Bolus ex Hooker F.) is one of the important cut flowers grown for domestic as well as for export market. Due to availability of wide range of exotic cultivars and their adaptability to grow on wide range of climatic conditions makes it profitable to the farmers as cut flower. Gerbera flowers are in various colours and form, which suit very well in different floral arrangement, are also ideal for beds, border, pots and rock garden. As the commercial cultivation of cut flowers has a good potential, introduction and popularization of high-yielding cultivars of gerbera is gaining importance. Protected cultivation is beneficial for better quality and high yield of flowers. Gerbera flowers grown under polyhouse are in good demand in domestic as well as in the international markets. Systematic work and information regarding the low-cost growing structures on quality and yield of exotic cultivars of gerbera flower production is lacking in India (Singh and Srivastava 2008, Thangam *et al.* 2009). In general, high investment is required for construction polyhouses made up of aluminum or iron pole. An attempt was made to evaluate the gerbera cultivars under two-low-cost growing structures, i.e. low cost polyhouse and shade net house, suitable for Meghalaya conditions.

The present experiment was carried out under low-cost polyhouse and shade net house at the Research Farm of the Division of Horticulture, ICAR Research Complex for NEH Region, Umiam 793 103, Meghalaya during 2008–09 in factorial randomized block design with three replications. Umiam is situated at 25° 41' N latitude, 91°55' E longitude

and 1 010 m altitude. Two types of growing structures, i.e. bamboo made polyhouse and shade net house were constructed.

The low-cost polyhouse was constructed with UV stabilized polyfilm (200 micron thickness) as a cladding material at the top surface and the sides were covered with green shade net (50%) to get proper ventilation. Shade net house was constructed with green UV stabilized shade net (50%) as a cladding material to cover the top surface and side walls of the shade net house for proper shade and ventilation. Tissue cultured plants (4–5 leaves) of 17 exotic gerbera cultivars, viz Daphne, Diego, Fenna, Ice Queen, Jaffana, Lieke, Lion, Lovely Disc, Mayonaise, Pound Sterling, Sienna, Stanza, Soleil, Torbin, Venicie, Wall Street and 68385 were procured from Sheel Biotech. (P) Ltd, New Delhi and grown in 3 row system at 30 cm × 30 cm spacing in 1 m broad bed accommodating 9 plants/m², during February 2008. The polyhouse/shade net house was 15 m long, 5 m breadth and 4 m central height. Maximum and minimum temperature was recorded inside polyhouse was 38°C and 10°C, respectively average relative humidity was 70%. Four plants from each cultivar and from each replication were randomly selected for recording observation on growth, flowering, quality and vase life parameters. Mean values of the all the 19 parameters were statistically analyzed and tabulated.

Data presented in Table 1 indicated that growing environment and cultivars had significant interaction on number of leaves/plant, leaf length, leaf breadth, plant spread and number of suckers/plant. Most of the cultivars produced more number of leaves/plant, suckers/plant and leaf breadth under polyhouse than under the shade net conditions. In contrary, parameters such as leaf length and plant spread were found more under shade net conditions than under polyhouse. Increased in leaf length may be due to reduction in light penetration under the 50% shade net house, thereby more spread of leaves. Significantly maximum number of leaves/plant (16.66 and 11.08 respectively) was recorded in Mayonaise under polyhouse and shade net. Cultivar Fenna

*Short note

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Table 1 Interaction effects of growing environments with gerbera cultivars for vegetative characters

Cultivar	Form	Colour	Leaves/ plant		Leaf length (cm)		Leaf breadth (cm)		Plant spread (cm)		Suckers/plant/ year	
			PH	SH	PH	SH	PH	SH	PH	SH	PH	SH
Daphne	D	Orange	13.16	9.16	25.62	32.26	7.75	7.71	37.31	39.67	2.74	2.50
Diego	D	Orange	12.33	9.33	32.83	36.35	13.00	11.85	41.49	43.78	2.49	2.38
Fenna	D	Red	12.33	9.33	41.16	48.50	13.87	11.96	44.46	46.29	3.66	2.59
Ice Queen	D	White	11.41	8.66	33.16	27.93	10.00	9.41	36.26	38.31	3.20	3.12
Jaffana	D	Dark orange	15.25	9.83	27.29	28.60	9.75	9.25	41.60	44.48	4.07	3.76
Lieke	D	Violet	15.08	10.91	40.29	41.78	11.25	10.16	45.80	50.04	2.80	3.74
Lion	D	Yellow	15.08	10.50	31.29	29.26	10.62	9.54	41.05	43.88	5.00	4.62
Lovely Disc	D	Cream white	11.58	8.25	28.50	28.08	7.25	8.68	45.10	46.44	3.67	3.49
Mayonaise	D	Yellow	16.66	11.08	33.16	32.26	9.75	9.20	40.96	43.56	4.06	3.71
Pound Sterling	D	Yellow	9.50	8.50	25.04	31.28	7.50	10.41	45.40	46.53	2.49	2.33
Sienna	D	Brown	11.16	8.16	33.37	43.53	10.73	12.00	39.24	41.65	4.40	4.06
Stanza	SD	Red	11.91	7.58	30.00	46.85	10.62	11.22	43.95	45.06	3.72	3.45
Soleil	D	Yellow	14.25	8.91	26.83	34.70	9.87	11.08	38.39	40.54	3.02	2.87
Torbin	D	White	13.33	9.83	34.16	39.83	11.12	10.43	37.00	37.92	2.68	2.54
Venicie	D	Pink	15.91	9.58	33.83	34.10	11.75	9.16	51.26	52.79	3.96	3.48
Wall Street	D	Cream	12.83	9.50	45.83	40.33	12.87	10.58	46.82	48.17	3.34	3.06
68385	D	Pink	13.75	10.58	33.83	34.86	11.25	9.79	40.73	42.33	3.73	3.54
SEm±			0.39		4.15		1.02		0.70		0.19	
CD (P=0.05)			1.10		11.74		2.89		1.97		0.55	

SD, Semi-double; D, double; PH, polyhouse; SH, shade net house

Table 2 Interaction effects of growing environments with gerbera cultivars for flowering characters

Cultivar	Days to bud mburst		Days to first flower opening		Flower diameter (cm)		Disc diameter (cm)		Stalk length (cm)		Stalk diameter (mm)	
	PH	SH	PH	SH	PH	SH	PH	SH	PH	SH	PH	SH
Daphne	131.00	141.66	139.23	151.00	10.22	10.38	2.38	2.30	55.06	68.16	5.84	4.72
Diego	99.58	109.33	109.58	119.33	9.44	9.44	2.84	2.58	46.84	57.10	6.40	5.33
Fenna	120.12	130.00	126.72	137.33	9.95	9.03	3.07	2.53	56.65	63.41	6.39	5.65
Ice Queen	125.33	135.66	131.13	141.33	10.07	9.02	3.01	2.35	54.43	63.78	5.94	5.40
Jaffana	128.50	140.00	138.53	149.00	10.39	8.91	2.86	2.75	52.98	53.01	5.85	5.49
Lieke	112.41	121.66	120.33	129.00	11.03	9.47	3.39	2.75	65.63	69.45	6.60	5.21
Lion	104.00	113.66	111.50	121.33	10.55	9.85	3.00	2.56	52.38	62.68	5.82	6.29
Lovely Disc	128.00	138.33	133.36	143.33	9.90	9.80	2.20	2.63	56.33	61.75	5.89	4.52
Mayonaise	122.36	131.66	127.77	136.33	9.55	9.44	2.80	2.89	46.79	63.18	6.31	5.44
Pound Sterling	135.66	145.66	143.60	155.33	10.55	10.29	2.45	3.07	54.73	59.43	7.03	5.52
Sienna	120.16	134.66	124.16	139.66	10.46	9.85	3.07	2.95	64.36	72.68	6.89	4.96
Stanza	124.66	135.33	132.06	143.33	10.68	10.23	2.43	2.70	55.61	63.18	6.72	5.82
Soleil	133.33	145.00	140.06	152.00	10.80	9.79	3.09	3.11	52.50	58.20	5.90	5.20
Torbin	100.00	113.66	108.41	122.00	11.10	9.82	3.08	2.76	51.84	66.18	6.79	5.50
Venicie	102.46	113.66	110.29	120.33	11.05	10.46	2.80	2.48	56.29	72.58	6.10	5.51
Wall Street	104.46	114.66	111.86	125.00	10.14	10.21	2.88	2.79	70.84	70.26	6.25	5.61
68385	124.56	133.00	131.30	140.33	10.84	9.45	3.04	2.67	60.37	65.03	6.66	5.65
SEm±	1.17		1.03		0.15		0.08		0.67		0.13	
CD (P=0.05)	3.30		2.92		0.42		0.24		1.90		0.37	

Table 3 Interaction effects of growing environments with gerbera cultivars for flowering characters

Cultivar	Fresh weight of stalk (g)		Fresh weight of flower head (g)		No. of flowers/plant/month		Durability of single flower (days)		Vase-life (days)		Ray floret length (cm)		Ray floret breadth (cm)		Number of ray floret/flower	
	PH	SH	PH	SH	PH	SH	PH	SH	PH	SH	PH	SH	PH	SH	PH	SH
Daphne	12.47	16.24	6.13	6.52	2.69	2.13	7.00	7.50	7.84	7.43	5.13	4.48	1.49	1.02	62.00	57.33
Diego	22.08	24.03	10.76	10.58	3.43	3.13	7.00	7.70	8.04	7.54	4.44	4.00	1.13	0.86	63.66	60.33
Fenna	18.52	21.47	8.30	10.45	3.09	2.78	9.00	9.76	8.72	8.51	4.01	3.86	1.33	1.02	56.00	55.33
Ice Queen	22.21	26.00	6.29	6.42	2.48	2.23	7.03	7.33	6.92	6.88	4.42	3.35	1.41	1.00	58.00	58.00
Jaffana	16.49	18.94	9.55	9.60	2.76	2.60	6.96	7.46	7.78	5.45	4.02	4.16	0.93	1.00	56.00	54.66
Lieke	19.55	23.57	12.57	11.86	2.48	2.30	7.70	7.80	9.81	8.72	5.04	4.21	1.10	0.95	60.66	60.00
Lion	19.38	22.11	9.22	9.35	3.69	3.35	9.40	9.70	9.64	9.18	4.39	4.08	1.22	0.89	61.66	61.33
Lovely Disc	16.46	20.88	9.08	9.38	2.37	2.11	5.40	5.76	7.65	6.91	4.12	4.38	1.04	0.93	56.33	53.33
Mayonaise	20.78	20.94	9.90	10.39	2.88	2.60	6.20	6.16	8.94	8.56	4.12	3.94	1.17	1.00	62.66	60.66
Pound Sterling	19.62	22.56	10.35	10.17	2.64	2.36	7.46	7.26	10.17	9.32	4.83	4.58	1.04	1.02	62.33	60.33
Sienna	20.73	24.19	9.43	9.37	2.84	2.53	8.50	8.83	8.58	8.27	4.85	4.09	1.41	1.03	54.33	52.33
Stanza	18.20	22.27	10.32	10.43	2.29	1.95	10.00	10.16	7.30	7.03	4.45	4.58	1.00	0.95	68.00	68.33
Soleil	15.90	18.72	9.66	9.45	2.86	2.49	8.00	9.36	6.22	5.83	4.43	4.31	1.11	1.02	63.66	66.33
Torbin	17.47	20.98	11.23	11.47	2.35	2.17	7.26	7.60	8.02	7.85	4.48	4.51	1.04	0.83	68.00	67.33
Venicie	16.08	19.93	9.39	9.68	3.42	3.27	7.00	7.60	8.29	7.95	4.76	5.30	1.14	0.92	54.33	52.66
Wall Street	22.21	25.82	9.12	9.33	3.33	3.16	6.96	7.60	9.16	8.91	4.60	4.38	1.37	1.27	69.66	70.00
68385	27.72	28.48	11.29	11.53	3.12	2.85	8.03	8.03	6.83	6.22	4.70	4.29	1.12	0.98	67.00	66.33
SEm±	0.77		0.37		0.06		0.15		0.22		0.10		0.02		1.85	
CD (P=0.05)	2.19		1.05		0.01		0.44		0.63		0.29		0.07		5.23	

produced longest leaves (48.50 cm), while shortest leaf was recorded in Ice Queen (27.93 cm) under shade net house. Broader leaf (13.87 cm) was recorded in Fenna, followed by Diego (13.00 cm) while narrowest leaves found in Lovely Disc (7.25 cm). Maximum plant spread was noted in cv. Venicie (52.79 cm), followed by Lieke (50.04 cm) and minimum in Torbin (37.92 cm). Multiplication of cultivars in terms of suckers produced by cultivar was found more under polyhouse than under shade net, being significantly maximum in Lion (5.00), followed by Sienna (4.40), Jaffana (4.07) and Mayonaise (4.06). Variability in flower colour in gerbera population by using image analysis has been reported (Singh *et al.* 2011).

Significant interaction of growing environments and cultivars on days to bud burst, days to first flower opening, flower diameter, disc diameter, stalk length and stalk diameter are presented in Table 2. All cultivars grown under polyhouse showed early bud burst and early first flower opening when compared to shade net. Early bud burst and days to first flower opening (99.58 days and 109.58 days, respectively) was recorded cv. Diego, while late bud burst and days to flower opening was noted in Pound Sterling (135.66 and 143.60 days respectively). Singh and Srivastava (2008) observed that the days taken to first flower opening among the all the gerbera varieties were earlier in low-cost polyhouse over shade net conditions. Favourable microenvironment prevailing under polyhouse may induce early flowering under polyhouse.

Quality parameters such as flower diameter, disc diameter, stalk diameter was found superior under polyhouse condition when compared to the shade net. Interestingly, cultivars grown under shade net produced longer stalk than the cultivars grown under shade net. Largest flower (11.10 cm and 11.03 cm respectively) was recorded in cv. Torbin and Lieke under polyhouse which was significantly higher than the cv. Venicie (10.46 cm) grown under shade net house. Maximum disc diameter was measured in Lieke (3.39 cm); longest flower stalk was produced in cv. Sienna (72.68 cm), Venicie (72.58 cm) and Wall Street (70.26 cm) under shade net house which was at par with Wall Street (70.84 cm) grown under polyhouse. Stalk diameter was found maximum in cv. Pound Sterling (7.03 mm) which was significantly superior over Lion (6.29 mm) grown under shade net. Stalk diameter of gerbera is an important parameter which finally leads to improve the vase life with the increase in thickness. The variation among the cultivars might be due to different varietal behaviour and their interaction with the production environment (Leffring, 1978).

Data presented in Table 3 indicated significant differences for the fresh weight of stalk and flower head, number of flowers/plant/month, durability of single flower, vase life, length and breadth of ray and disc florets and number of ray florets/flower head. Majority of the cultivars under study

grown in shade net house showed higher fresh weight of flower stalk and flower head, being maximum in cv. 68385 (28.48 g) and cv. Lieke (11.86 g) respectively. Highest number of flowers/plant/ month was recorded in cv. Lion (3.69), Diego (3.43) and Venicie (3.42) grown under polyhouse. Naik *et al.* (2006) explains that the increase flower yield under polyhouse might be attributed to the more number of leaves/plant would have resulted in production and accumulation of maximum photosynthesis, resulting in production of more number of flowers with bigger size. Maximum durability of single flower head was recorded in Stanza (10.00 and 10.16 days respectively) under polyhouse and shade net. Cultivars with more durability could be used to prolong the blooming period. Long vase life was recorded from all the cultivars grown under polyhouse compared to shade net house. Significantly longer vase life was recorded from cv. Pound Sterling (10.17 days), followed by Lieke (9.81 days) and Lion (9.64 days). Singh and Srivastava (2008) also reported improvement in vase life of the gerbera cultivars grown under polyhouse over shade net house. Significantly long ray florets were recorded in cv. Venicie (5.30 cm) under shade net, while broader ray florets was recorded in cv. Daphne (1.49 cm) under polyhouse. More number of ray florets/flower was found in cv. Wall Street (70.00 and 69.66, respectively) under shade net and polyhouse, which were statistically at par. Nair and Medhi (2002) also reported variation in number of ray florets in gerbera cultivars.

SUMMARY

A study was conducted to evaluate the 17 exotic cultivars of gerbera (*Gerbera jamesonii* Bolus ex Hooker F.) under low-cost bamboo made polyhouse and shade net (50%) house for their growth, flowering, quality and yield for suitability under Meghalaya conditions, during 2008-09. The results revealed that low-cost bamboo made polyhouse-grown gerbera plants produced significantly more number of suckers/plant, flower and stalk diameter, number of flowers/plant/month and vase-life than grown under shade net house. Among the 17 cultivars studies, cultivars Diego, Lieke, Lion, Pound Sterling, Torbin, Venicie and Wall Street were found promising under low-cost polyhouse and recommended for commercial cultivation for Meghalaya.

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