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Evaluation of parthenocarpic cucumber genotypes for yield and its contributing traits under protected environment of N-W Himalayas

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Abstract
Fourteen genotypes of parthenocarpic cucumber were evaluated under modified naturally ventilated polyhouse at the Experimental Farm, Department of Vegetable Science and Floriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur during spring summer season, 2017-18. It was revealed that DDPCG-1 was the earliest in first flowering as well as picking attributable to shortest inter-nodal length. The majority of cultivars exhibited very narrow variations for fruit length and diameter. The line DDPCG- 4 produced highest number of fruits whereas DDPCW-1 expressed significantly highest fruit weight. The highest fruit yield per m^2 was recorded in DDPCG-1 followed by DDPCW-1. The economic analysis also identified DDPCG-1 and DDPCW-1 as highly remunerative because the seed cost is very less as compared to the seed cost of hybrids and expressing the potentiality of growing fibre rich parthenocarpic cucumber under protected conditions to double the income and nutritional status of farmers in shorter cropping period.

Keywords: parthenocarpic, remunerative, quality, yield

1. Introduction
In North-West Himalayas, there is severe winters and mild summers with high rainfall characterize the place. Agro-climatically, the location represents the mild-hill zone of Himachal Pradesh. Humid sub-temperate climate with high rainfall (2500 mm), of which about 75 per cent is received during the period of June to September.

Cucumber (*Cucumis sativus* L.) is a member of the gourd family Cucurbitaceae, which comprises of 117 genera and 825 species in warmer parts of the world [1]. Cucumber is one of the oldest and most popular cultivated cucurbitaceous crop. It is thermophilic and frost susceptible species growing best at temperature above 20^0C. The crop is grown throughout the world and is the fourth most important vegetable crop after tomato, cabbage and onion and the second most widely cultivated cucurbit after water melon. It is a low energy and high water content salad crop. In open field conditions, cucumber can be grown in both summer and rainy seasons with varying success. In low and mid hills of the state, farmers are growing commercial crop of monoecious hybrid cucumber in open environment and experience number of problems viz., heavy incidence of red pumpkin beetle and fruit fly and poor fruit quality including bitter fruits due to vagaries of weather, varying moisture etc. The farmers spray pesticides indiscriminately to check the beetle and fruit fly and occasionally incur heavy losses.

Thousands of naturally ventilated polyhouses have been constructed under RKVY and HTM schemes in the state and these naturally ventilated polyhouses can effectively be used for commercial cultivation of parthenocarpic cucumber by mitigating the influence of various abiotic and biotic stresses. The primary type of cucumber grown in greenhouses is parthenocarpic and seedless. The fruits are mild in flavour and have a thin edible skin that requires no peeling. Cultivation of parthenocarpic cucumber in greenhouses having partial environment control has been undertaken during last decade in our country and very little work has been done for developing varieties/hybrids for protected environment. As on today the polyhouse growers of the state are growing private sector hybrids available in the market but the cost of the parthenocarpic cucumber seed is very high and beyond the approach of common farmer. Thus, there is a need to identify cultivars suitable for protected cultivation for hilly regions of the country.

2. Materials and methods
The experiment was carried out at the experimental farm of Department of Vegetable Science and Floriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur during spring summer of 2017-18. The experimental material comprised of 14 diverse genotypes of parthenocarpic cucumber including check. The experiment was conducted in Randomized Block Design (RBD) replicated thrice inside the modified naturally ventilated polyhouse. Eighteen plants of each genotype were planted at a spacing of 70 cm × 30 cm and trained on single stem.

Table 1: List of parthenocarpic cucumber genotypes used in the study and their sources

Sr. No.	Genotypes	Source
1	DDPCG-1	CSKHPKV, Palampur
2	DDPCG-2	CSKHPKV, Palampur
3	DDPCG-3	CSKHPKV, Palampur
4	DDPCG-4	CSKHPKV, Palampur
5	DDPCG-5	CSKHPKV, Palampur
6	DDPCG-6	CSKHPKV, Palampur
7	DDPCG-7	CSKHPKV, Palampur
8	DDPCG-8	CSKHPKV, Palampur
9	DDPCW-1	CSKHPKV, Palampur
10	DDPCW-2	CSKHPKV, Palampur
11	DDPCW-3	CSKHPKV, Palampur
12	DDPCW-4	CSKHPKV, Palampur
13	DDPCW-5	CSKHPKV, Palampur
14	Kian (check)	Nunhems Company

Observations were recorded on five randomly selected plants on the traits viz., days to 50 per cent flowering, days to first picking, fruit yield/plant, fruit yield (kg)/m^2 area, number of fruits/vine, fruit length, fruit girth, fruit weight, harvest duration, internodal length and vine length. For total soluble solids (°brix) the fruits were taken from the 5^{th} picking. Economical analysis has also done on the basis of yield of the crop. The data on different parameters were subjected to statistical analysis by the method described by [2].

2. Results & Discussion

Earliness is a desired trait in cucumber as the market prices are generally high early in the season. Days to first female flower and days taken to first harvest are indicators of early maturity. Genotype DDPCG-1 was found to be significantly superior over the standard check Kian for days to flower and first picking whereas genotype DDPCW-1 was statistically at par.

Table 2: Performance of cucumber genotypes for growth and yield parameters

Genotypes	Days to flowers	Days to first picking	Number of fruits per vine	Marketable yield per plant (kg)	Marketable yield (kg) per m^2	Internodal length (cm)	Vine length (m)	Harvest duration (days)
DDPCG-1	12.33	33.10	27.15	3.85	23.10	8.87	3.82	50.83
DDPCG-2	14.54	36.37	24.6	2.77	16.62	10.62	3.71	41.17
DDPCG-3	16.33	41.17	20.54	1.99	11.94	11.10	4.13	38.00
DDPCG-4	13.45	35.67	29.89	3.18	19.06	9.92	4.33	52.17
DDPCG-5	14.30	36.17	23.70	2.33	13.98	12.50	3.80	45.50
DDPCG-6	14.50	35.67	18.65	1.81	10.86	10.47	2.77	43.00
DDPCG-7	13.33	34.93	25.8	3.12	18.72	11.68	3.71	41.33
DDPCG-8	14.73	36.17	21.94	2.62	15.72	11.20	3.79	44.00
DDPCW-1	13.00	34.37	24.00	3.55	21.30	9.08	3.95	49.17
DDPCW-2	14.50	35.67	18.29	1.88	11.28	10.00	2.95	43.67
DDPCW- 3	14.93	37.50	21.99	2.53	15.18	10.47	3.43	43.83
DDPCW-4	14.00	36.87	23.04	2.90	17.40	10.55	3.65	45.54
DDPCW-5	13.45	35.55	25.40	3.15	18.90	10.00	3.35	44.43
Kian (check)	13.17	34.75	28.20	3.29	19.74	9.65	2.94	49.67
CD (p=0.05)	0.80	1.55	2.26	0.52	1.85	0.71	0.35	4.21

Table 3: Performance of cucumber genotypes for quality and economical parameters

Genotypes	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Total Soluble solids (°Brix)	Cost of cultivation (Rs./m^2)	Gross returns (Rs./m^2)	Net returns (Rs./m^2)	Output: input ratio
DDPCG-1	21.94	13.83	141.80	3.35	135.15	462	326.85	3.42
DDPCG-2	16.12	11.99	112.60	3.40	135.26	332.4	197.14	2.46
DDPCG-3	15.24	13.77	96.88	3.25	135.90	238.8	102.90	1.76
DDPCG-4	22.25	14.07	106.26	3.20	136.34	381.12	244.78	2.80
DDPCG-5	15.31	13.00	98.31	3.38	135.90	279.6	143.70	2.06
DDPCG-6	16.77	12.19	97.05	2.80	136.15	217.2	81.05	1.60
DDPCG-7	21.62	13.59	120.93	3.31	136.40	374.4	238.00	2.74
DDPCG-8	17.69	13.16	119.42	3.11	136.20	314.4	178.20	2.31
DDPCW-1	22.65	14.15	147.92	3.68	134.00	426	292.00	3.18
DDPCW-2	18.23	12.61	102.79	2.87	134.50	225.6	91.10	1.68
DDPCW- 3	18.56	12.73	115.05	3.00	134.70	303.6	168.90	2.25
DDPCW-4	16.45	12.98	125.87	3.22	134.50	348	213.50	2.59
DDPCW-5	17.45	13.08	124.02	3.02	134.92	378	243.08	2.80
Kian (check)	18.37	13.21	116.67	3.12	143.20	394.8	259.80	2.92
CD (p=0.05)	1.09	0.62	6.02	0.23	NS	21.81	36.24	0.37

(Table 2). Highest number of fruits per vine was observed in genotype DDPCG-1 which was significantly superior to standard check whereas genotype DDPCW-1 was at par. Genotypes DDPCG-1 had significantly highest yield per plant & per m^2 over the standard check Kian whereas genotype DDPCW-1 was statistically at par.

Internodal length determines the height and number of nodes per plant. The parthenocarpic cucumber hybrids bear fruits at almost every node. Therefore, plants having less internodal length and more number of nodes are desired for getting higher yield. Minimum internodal length was observed in genotype DDPCG-1 which was significantly superior to standard check whereas genotype DDPCW-1 was at par. Maximum vine length and harvest duration was found in genotype DDPCG-4 which was significantly superior to standard check Kian.

In cucumber, fruit length, fruit girth and fruit weight influence marketable yield as well as consumer preference. Fruit with cylindrical straight shape having tenderness are preferred by the consumers and fetch lucrative returns to the growers. For fruit quality characters like fruit length, breadth, weight and total soluble solids, the majority of cultivars exhibited very narrow variations but highest was found in DDPCW-1 which was significantly superior over the standard check Kian (table 3).

Highest net returns and Output: Input ratio were recorded in genotype DDPCG-1 which was significantly superior to the standard check Kian whereas genotype DDPCW-1 was statistically at par. The results were in the line for growth parameters with the findings of [3-4] in cucumber [5-6], in bottle gourd. Similar results for yield and yield attributes were recorded by [7-9] in cucumber [10], in musk melon [11], in spine gourd [12-15], in bitter gourd.

3. Conclusions

Genotypes DDPCG-1 had highest yield per plant & per m^2 followed by DDPCW-1. This was due to early flowering and picking and lesser inter-nodal length in these genotypes. Genotype DDPCG-4 recorded highest number of fruits per vine because it had longer harvest duration and highest vine length. Fruit quality characters like fruit length, breadth, weight and total soluble solids was highest in DDPCW-1. DDPCG-1 and DDPCW-1 was highly remunerative because these genotypes had more yield per vine & per m^2.

4. References

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