

Short Communication

Punjab Kheera-1: A new variety of parthenocarpic cucumber for poly-net house cultivation

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The role of parthenocarpic cucumber hybrids/varieties in increasing the production and productivity of poly-net house grown cucumber is well recognized in the world. The higher yield potential of parthenocarpic cucumber is often higher than that of conventional seeded varieties due to its association with gynoeceous trait and also due to the fact that pollination is not a prerequisite for fruit set as it is in seeded cucumber. Moreover, the energy required to produce seeds in conventional seeded cultivars is not needed in parthenocarpic hybrids as these hybrids are seedless and the conserved energy will be utilized to produce more fruits in parthenocarpic hybrids. However, cultivation of cucumber under protected conditions in India is restricted due to non-availability of suitable parthenocarpic gynoeceous varieties/hybrids from public sector and high cost of the hybrid seeds developed by the private sector (Kumar et al. 2016). Moreover, parthenocarpic gynoeceous varieties/hybrids available in the country usually become unstable, that is, gynoeceism breaks down under high temperature conditions of protected structures (Cantliffe 1981). Consequently, development of high yielding stable parthenocarpic gynoeceous varieties/hybrids for protected cultivation is immensely needed. In 2018, Punjab Agricultural University, Ludhiana has released seedless parthenocarpic cucumber variety "Punjab Kheera-1" (Figure -1) for commercial cultivation in poly-net house.

The present research work was conducted at Vegetable Research Farm, Punjab Agricultural University, Ludhiana, India, from 2013-14 to 2017-18. In the study, cucumber crop was sown twice in each year under poly-net house during 2013-14 to 2017-18. The first crop of cucumber

was sown in first week of September and its seeds were directly sown in the soil on the raised beds. The second crop was sown in first week of January in the plastic plug trays and transplanted in first week of February. The rooting media used in plastic plug trays was soil-less and composed of cocopith, perlite and vermiculite in the ratio of 3:1:1 respectively. The beds were made 100 cm wide (from base) and 15 cm height. The seedlings/seeds were transplanted/sown at row to row and plant to plant spacing of 50 cm and 30 cm respectively with zigzag way. The standard package of practices recommended for the crop was followed to raise a healthy crop (Dhall 2018). The plants were trained upwards so that the main stem is allowed to climb to the overhead wire along a polythene twine. All the laterals and fruits were removed from the main stem up to 20 cm from the ground level. The eight advance breeding lines and two commercial hybrids (KUK-9 of Namdhari Seeds, Multistar of Rizak Jawan Seeds) as check were evaluated for estimation of various yield and quality traits along with their reaction to diseases from 2013-14 to 2017-18 but the results of only released variety "Punjab Kheera-1" were discussed in this manuscript. The data were recorded for fruit weight (g), fruit length (cm), fruit diameter (cm), number of fruits per vine, total yield (q/ha), dry matter (%), ash content (%), ascorbic acid (mg/100g) and total soluble solids (%). The data recorded were subjected to analysis of variance to detect genotypic differences. The analysis was carried out using computer software CPCS1 statistical package. The PDI of downy mildew were recorded by using 0-5 visual rating scale and categorized as resistant (0-25%), moderately resistant (26-40%), Susceptible (41-60 %) and highly susceptible (>60%). The scoring for wilt was done using scale of 1-4 where 1= 1-5% Moderately Resistant, 2= 6-10% Moderately Susceptible, 3=11-20% Susceptible, 4= >20-100% Highly Susceptible. The root-knot nematode was characterized using scale of 0-5

(Taylor and Sasser, 1978).

Number of fruits per vine: The mean number of fruits per vine in September sown crop of 'Punjab Kheera-1' was 21.08 which was significantly higher (14.44%) than check hybrid 'KUK-9' but non-significantly lower than the check hybrid 'Multistar' (table 2). However, mean number of fruits per vine in January sown crop of 'Punjab Kheera-1' was 24.66 which was significantly at par with check hybrid 'Multistar' and 15.88% higher than the check hybrid 'KUK-9'. It was observed that the time of planting affect the number of fruits per vine as more fruits per vine were observed in January sown crop. An increase in number of fruits per vine in January sown crop may further be attributed to the reason that plants remain physiologically more active to build up sufficient source for the developing flowers, ultimately leading to a greater number of fruits. These results are in conformity with the findings of Dhall (2018).

Fruit weight (g): From consumer acceptability point of view, higher fruit weight in seedless cucumber is not desirable character and average fruit weight of about 110-150g is generally preferred by consumers. Among genotypes and years, the maximum average fruit weight (145.3 g) was observed in hybrid 'KUK-9' (January sown) during 2015-16 while minimum (110.0 g) in variety 'Punjab Kheera-1' (September sown) during 2014-15. The mean fruit weight in September sown crop of 'Punjab Kheera-1' was 115.95 g which was significantly lower (11.29%) than check hybrid 'KUK-9' but at par with the check hybrid 'Multistar' (Table 2). However, mean fruit weight in January sown crop of 'Punjab Kheera-1' was 122.58g which was at significantly at par with check hybrid 'Multistar' and significantly lower (12.09%) than the check hybrid 'KUK-9'. Similar results were corroborated by Dhall and Singh (2016).

Fruit length (cm): Among genotypes and years, the maximum average fruit length (19.0 cm) was observed in hybrid 'KUK-9' (January sown) during 2014-15 while minimum (13.0 cm) in variety 'Punjab Kheera-1' (September sown) during 2014-15. The mean fruit

length in September sown crop of 'Punjab Kheera-1' was 13.50 cm which was significantly lower (18.82%) than check hybrid 'KUK-9' but non-significantly different from the check hybrid 'Multistar' (Table 2). However, mean fruit length in January sown crop of 'Punjab Kheera-1' was 15.00 cm which was at significantly at par with check hybrid 'Multistar' and significantly lower (16.11%) than the check hybrid 'KUK-9'. Similar results for fruit weight in cucumber were reported by Kaur et al (2016) and Singh et al (2016).

Fruit diameter (mm): Higher fruit diameter is not desirable attribute for parthenocarpic cucumber. Among genotypes and years, the minimum (30.5 mm) and maximum (38.4 mm) average fruit diameter was observed in hybrid 'Multistar' during 2014-15 (September sown) and during 2015-16 (January sown). The mean fruit diameter in September sown crop of 'Punjab Kheera-1' was 32.60 mm which was significantly at par with both the check hybrids (Table 2). However, mean fruit diameter in January sown crop of 'Punjab Kheera-1' was 33.68 mm which was at significantly at par with both the check hybrids. It was concluded that there were non-significant differences between the 'Punjab Kheera-1' and the check hybrids for fruit diameter during both the sowing seasons. Similar results for fruit weight in cucumber were reported by Kaur et al (2016) and Singh et al (2016).

Quality characters: This new variety "Punjab Kheera-1" has ash content of 8.0% on dry weight basis (Table 3) which is significantly higher than the check hybrids (5.0% in Multistar; 7.0% in KUK-9). The dry matter content of 'Punjab Kheera-1' was 2.82% which is significantly at par with both the check hybrids. The ascorbic acid content of 'Punjab Kheera-1' was 5.3 mg/100g which is non-significantly different from the check hybrid 'KUK-9' but significantly different from the check hybrid 'Multistar'. The total soluble content (TSS) of 'Punjab Kheera-1' was 2.6 per cent, respectively which is non-significantly different from the check hybrid. Similar results were corroborated by Dhall and Singh (2016).

Table 1: Total yield (q/ha) at PAU, Ludhiana

Variety/ Hybrid	Year								Mean		Percent increase (+) or decrease (-) over check	
	2013-14		2014-15		2015-16		2016-17		Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown
	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown				
Punjab Kheera-1 (variety)	726.0	990.0	798.4	924.0	814.3	968.7	725.8	920.4	766.13	950.78	-	-
Multistar (check hybrid)	-	-	819.7	958.1	838.8	1006.0	785.1	980.9	814.53	981.67	- 5.94	- 3.15
KUK-9 (check hybrid)	747.3	1011.3	787.7	936.8	789.9	962.3	710.8	890.8	758.93	950.30	+ 0.95	+ 0.05
CD at 5% level	42.2	56.8	35.8	60.1	52.2	46.7	22.8	26.8				

Table 2: Yield attributing traits

Variety/ Hybrid	Year								Mean		Percent increase (+) or decrease (-) over check	
	2013-14		2014-15		2015-16		2016-17		Mean			
	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown	Sept. Sown	Jan. Sown
<i>Number of fruits per vine</i>												
Punjab Kheera-1	20.03	24.76	22.09	25.08	21.01	24.00	21.20	24.80	21.08	24.66		
Multistar (c)	-	-	21.06	24.70	21.50	24.26	22.04	25.50	21.53	24.82	- 2.09	- 0.64
KUK-9 (c)	18.12	21.48	18.08	21.23	17.40	20.02	20.08	22.40	18.42	21.28	+ 14.44	+ 15.88
CD at 5% level	1.87	1.96	2.42	2.01	1.89	2.50	1.05	1.28				
<i>Fruit weight (g)</i>												
Punjab Kheera-1	115.0	118.3	110.0	120.3	118.0	126.7	120.8	125.0	115.95	122.58		
Multistar (c)	-	-	116.3	125.7	124.0	128.3	125.6	118.5	121.97	124.17	- 4.94	- 1.28
KUK-9 (c)	125.0	140.7	130.3	135.0	136.7	145.3	130.8	136.8	130.70	139.45	- 11.29	- 12.09
CD at 5% level	9.5	8.6	10.4	9.9	9.2	10.6	6.5	5.2				
<i>Fruit length (cm)</i>												
Punjab Kheera-1	13.5	15.0	13.0	15.5	14.0	15.0	13.5	14.5	13.50	15.00		
Multistar (c)	-	-	15.0	15.5	14.5	16.0	14.0	15.2	14.50	15.57	- 6.89	- 3.66
KUK-9 (c)	16.0	17.5	17.0	19.0	16.5	17.5	17.0	17.5	16.63	17.88	- 18.82	- 16.11
CD at 5% level	1.14	1.76	1.52	1.68	1.35	1.71	0.92	1.02				
<i>Fruit diameter (mm)</i>												
Punjab Kheera-1	32.5	33.2	31.2	32.9	33.9	35.3	32.8	33.3	32.60	33.68		
Multistar (c)	-	-	30.5	31.6	34.1	38.4	32.6	35.9	32.40	35.30	+ 0.31	- 4.59
KUK-9 (c)	32.2	34.8	31.1	33.0	30.8	34.6	31.0	34.6	31.28	34.25	+ 4.22	- 1.66
CD at 5% level	2.31	2.84	3.05	3.22	2.68	3.68	2.80	3.01				

Table 3: Quality traits

Variety/ Hybrid	Dry matter (%)	Ash content (% DW)	TSS (%)	Ascorbic acid (mg/100 g)
Punjab Kheera-1 (variety)	2.82	8.0	2.6	5.3
Multistar (check hybrid)	3.08	5.0	3.0	6.3
KUK-9 (check hybrid)	3.02	7.0	2.7	5.0

Reaction against diseases: Artificial screening for downy mildew, wilt and root-knot nematode was conducted under poly-net house conditions. Upon screening against downy mildew, Punjab Kheera-1 gave disease severity percent of 28.0 having moderately resistant reaction (Table 4) which was less than both the check hybrid 'Multistar' (68.0%) and KUK-9 (39.0%). Upon screening against wilt incidence, Punjab Kheera-1 gave disease severity percent of 5.0% having moderately resistant reaction (Table 4) which was less than both the check hybrid 'Multistar' (20.0%, susceptible reaction) and KUK-9 (6.0%, moderately susceptible). Root gall index were studied for root-knot nematode disease and observed that the Punjab Kheera-1 along with both the check hybrids were susceptible to root-knot nematode disease.

Total yield (q/ha): Yield is a complex character which involves the interaction of several intrinsic and external factors. It largely depends upon the production and mobilization of carbohydrates, uptake of nutrients and water from the soil and the hormonal balance, in addition to several environmental factors to which plant is

Table 4: Reaction to diseases (downy mildew, wilt, root knot nematodes)

<i>Downy mildew under artificial conditions</i>		
Variety/Hybrid	Downy mildew severity (%)	Reaction
Punjab Kheera-1 (variety)	28.0	Moderately Resistant
Multistar (check hybrid)	68.0	Highly Susceptible
KUK-9 (check hybrid)	39.0	Moderately Resistant
<i>Wilt incidence under artificial conditions</i>		
Variety/Hybrid	Wilt Incidence (%)	Reaction
Punjab Kheera-1 (variety)	5.0	Moderately Resistant
Multistar (check hybrid)	20.0	Susceptible
KUK-9 (check hybrid)	6.0	Moderately Susceptible
<i>Nematodes under artificial conditions</i>		
Variety/Hybrid	Root gall Index (0-5) Scale	Reaction
Punjab Kheera-1 (variety)	3.6	Susceptible
Multistar (check hybrid)	3.8	Susceptible
KUK-9 (check hybrid)	3.6	Susceptible

exposed during the growing period (Schaffer and Andersen, 1994). In addition, cucumber yield depends not only on the accumulation of photo assimilates during the crop growth and development, but also on its partitioning in the desired storage organs (Jiang *et al.* 2012). It was evident from the data given in Table 1 that mean total yield of new variety 'Punjab Kheera-1' from September sown crop was 766.13 q/ha which

was 0.95% higher than the check hybrid 'KUK-9' and 5.94% lower than the check hybrid 'Multistar'. However, January sown crop of 'Punjab Kheera-1' gave mean total yield of 950.78 q/ha which was at par with check hybrid 'KUK-9' and 3.15% less than the check hybrid Multistar. The lower yield in September sown crop was due to the fact its crop duration is less (First week of September to last week of December) than the January sown crop (First week of January to last week of May). In addition, the September crop was more infested with severe diseases like wilt and insect pest like white fly), which results into lower yields as compared to January sown crop. No doubt, the yield of "Punjab Kheera-1" is slightly lower than the check hybrid 'Multistar' but this yield difference is permissible between variety and hybrid. These results are in conformity with the findings of Dhall (2018).

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