



## KHEERA LOCAL : A NEW HIGH YIELDING, WELL ADAPTABLE AND HEAT TOLERANT CUCUMBER (*CUCUMIS SATIVUS* L.) VARIETY

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### ABSTRACT

Kheera local, a high yielding, well adaptable and heat tolerant variety was evolved through recurrent selection. The most distinguishing traits of this variety are its attractive fruit colour, better 1000-seed weight, crispiness, heat tolerance and yield which made it superior over the existing commercial varieties. The variety was tested in replicated varietal trials from 2012 to 2016. Kheera local average fruit yield is 14 t ha<sup>-1</sup>. It competes to all commercial varieties being planted in the field. This variety is tolerant to high temperature, fungal and viral diseases. Average flowering days are 40-45 and average 1000-seed weight is 26-30 g. Kheera Local has partly brown, short spines fruit surface having fruit length 13-18 cm. Its shelf life is better than other varieties. Kheera Local was approved during the year 2017. It is the only cucumber variety that is approved so far in Pakistan.

KEYWORDS: *Cucumis sativus*; cucumber; kheera; new cultivar; high yielding; temperature tolerant; Pakistan.

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### INTRODUCTION

Cucumber (*Cucumis sativus*) is one of the most popular vegetables in the world. It belongs to the cucurbitaceae family alongwith melon, squash and pumpkin. This vegetable is fourth most important after tomato, cabbage and onion in Asia (Eifedigi and Remison 2010). Cucumber is believed to be native to India, being widely grown in China, Cameroon, Iran, Russian Federation and Turkey. There are three main types of cucumber i.e. slicing, pickling and seedless. Cucumbers contain multiple B vitamins, including vitamin B<sub>1</sub>, vitamin B<sub>5</sub> and vitamin B<sub>7</sub> (biotin). B vitamins are known to help ease feelings of anxiety and buffer; some of the damaging effects of stress. Cucumber is rich in two of the most basic elements needed for healthy digestion; water and fibre. Cucumber is very low in calories (16 calories per cup) and it also contains fibre in the skin. The foods that contain fibre can help maintain a healthy weight. Pulp and seed have cooling effect, tonic, diuretic and the former is beneficial in chronic or acute eczema. Cucumber oil is good for brain and body and is also used in cosmetics.

Photosynthesis is the fundamental physiological process to provide energy and carbon assimilation for growth and reproduction of plants. It is often inhibited before other cell functions are impaired due to its high sensitive to high temperature stress. Kheera Local can tolerate temperature above 40°C. Cucumber may have a complex physiological change to resist short-term heat shock and suppress the development of the downy mildew disease (Dixing *et al.*, 2016).

Cucumber variety "Kheera Local" was developed for the summer season cultivation. This variety performs better when normally cultivated in the month of February and gives fruit till end of June when no other exotic material can survive. The fruit size, shape and colour of this variety is attractive, so farmers will incline to cultivate this variety. Further, this variety has the potential to tolerate heat, fungal and viral diseases as compared to other commercially cultivated varieties in Punjab. Kheera Local was developed through recurrent selection method of breeding from indigenous material. It can ensure cucumber availability during scarcity period.

In Pakistan, 52766 tonnes cucumber was produced from an area of 3426 hectares during 2014-15 with an average yield of 15.4 t ha<sup>-1</sup>. In Punjab 43298 tonnes cucumber was produced from an area of 1805 hectares during the same year. Punjab shares about 52.68% in area and 82% in production of cucumber (GoP, 2015). The major cucumber growing districts are Rawalpindi, Multan, Bahawalpur, Sahiwal, Faisalabad, Lahore, Sargodha and Gujranwala in Punjab (Anon, 2015-16). It is mostly consumed as fresh vegetable in the form of salad.

There was growing demand from farmers for a high yielding, disease resistant and heat tolerant cucumber variety. So this new variety is tolerant to high temperature and downy mildew. No serious insect/pest has been recorded on cucumber variety Kheera local so far. It also showed more tolerance against downy mildew than commercial varieties.

## MATERIALS AND METHODS

Kheera Local was developed through recurrent selection procedure at Vegetable Research Institute, (VRI), AARI, Faisalabad, Pakistan. Kheera Local is an improved selection from the indigenous material, which is heat tolerant and high yielding. It has good and wide range of adaptability. Its fruit shape, size and colour are highly attractive to the end users. Kheera Local occupies a prominent position in the market which encourages the farmers to grow it on large scale due to its heat tolerance capability.

This newly evolved variety was tested in adaptability yield trials conducted from 2012-16 at VRI, Faisalabad, for its yield potential and heat tolerance. Agronomic studies were carried out at Agronomic Research Institute, AARI, Faisalabad during 2015 to test the performance of Kheera Local at different plant spacings. To measure the susceptibility and resistance of the variety against diseases (downy mildew and collar rot) and insect pests (jassid, whitefly, thrips, mites and leaf miner), certain trials were also conducted alongwith checks.

Data on different agronomic traits like yield, days to 50% flowering, plant height, fruits per plant and other morphological traits (fruit shape, fruit colour, flower colour, anther colour, hirsute on surface of leaflet) were also taken from all trials to evaluate the consistency and uniformity of these traits in successive generations.

## RESULTS AND DISCUSSION

### Adaptability trials

Adaptability trials were conducted during the year 2012-16 in RCBD. The fruit yield performance of candidate variety Kheera Local over the years is discussed as under:-

In adaptability trials during 2012 (set-I), Kheera Local topped in yield (11.1 t/ha) as compared with other commercial varieties Kargil, Waqar, Akbar, Anmol and Captan (Table 1).

**Table 1. Performance of Kheera Local in adaptability trial at Vegetable Research Institute, Faisalabad during the year 2012.**

Rank	Varieties	Germination %	No. of fruits/plant	Fruit yield (t ha <sup>-1</sup> )
<b>Set-I</b>				
1.	Kheera Local (check)	70.2	6.0	11.1
2.	Kargil	63.3	7.5	8.3
3.	Waqar	63.3	5.5	6.8
4.	Akbar	64.2	6.0	6.6
5.	Anmol	59.2	5.8	5.8
6.	Captan	68.3	5.8	5.4
<b>Set-II</b>				
1	Kheera Local (check)	4.0	6.8	1
2	More Pick	4.5	4.0	2

Germination percentage of this variety was 70.2%. Its yield performance was good because it has better fruit size and can tolerate heat due to which it remains late in field. In set-II, this variety also excelled in fruit yield (6.8 t ha<sup>-1</sup>) (Table 1).

In adaptability trials conducted during 2013, germination percentage of Kheera Local was 81.7% and 79.3% with a fruit yield of 12.6 and 11.1 t/ha in set-I and set-II, respectively.

**Table 2. Performance of Kheera Local in adaptability trial at Vegetable Research Institute, Faisalabad during the year 2013.**

Rank	Varieties	Germination%	No. of fruits/plant	Fruit yield (t ha <sup>-1</sup> )
<b>Set - I</b>				
1.	Kheera Local (check)	81.7	4.7	12.6
2.	HCU-40	65.8	6.3	6.3
3.	Akbar	77.5	5.7	5.7
4.	EGS-172	72.5	6.7	5.4
5.	Waqar	75.8	5.0	5.3
6.	Kargil	67.5	4.3	4.3
<b>Set - I</b>				
1.	Advanta 701	79.3	4.3	18.5
2.	Advanta 719	80.7	5.0	11.2
3.	Kheera Local (Check)	91.1	5.0	11.1
4.	Advanta 718	95.6	3.3	10.3
5.	Advanta 706	90.4	3.3	8.5

In adaptability trials conducted during 2014, (set-I and set-II), Kheera Local gave the highest yield in set-I (5.4 t ha<sup>-1</sup>) and set-II (9.8 t ha<sup>-1</sup>) with number of fruits per plant i.e. and 1.9 and 2.7, respectively (Table 3). Germination percentage of Kheera Local was also highest in set-II (86.7%).

**Table 3. Performance of Kheera local in adaptability trial at Vegetable Research Institute, Faisalabad during the year 2014.**

Rank	Varieties	Germination%	No. of fruits / plant	Fruit yield (t ha <sup>-1</sup> )
<b>Set – I</b>				
1.	Kheera Local (check)	86.7	1.9	5.4
2.	CKD 188-F <sub>1</sub>	68.3	2.7	5.2
3.	CKD 1244-F <sub>1</sub>	70.0	2.5	5.2
4.	Hilton	78.3	2.5	5.1
5.	Diamond	65.0	2.8	4.9
6.	CUC Hy 801	63.3	2.5	4.8
<b>Set – II</b>				
1.	Kheera Local (check)	74.2	2.7	9.8
2.	Rocky F <sub>1</sub>	97.5	4.1	9.7
3.	Anmol	85.8	3.7	9.4
4.	Captan	79.2	4.2	9.3
5.	Ramzan	84.2	4.0	8.1
6.	Hashim	77.5	4.2	7.8

During the year 2015 Kheera Local was compared with four other varieties at the Institute. Kheera Local produced higher yield (17.6 t ha<sup>-1</sup>) (Table 4). However, French Green stood at par with Kheera Local for germination and yield.

**Table 4. Performance of Kheera local in Adaptability Trial at Vegetable Research Institute, Faisalabad during 2015-2016.**

Rank	Varieties	Germination %	No. of fruits/plant	Fruit yield (t ha <sup>-1</sup> )
<b>2015</b>				
1	Kheera Local (check)	69.9	4.3	17.6
2	French Green	66.7	8.1	17.2
3	Shayam F <sub>1</sub>	83.3	6.0	16.2
4	HCU-163	72.5	7.3	15.8
5	Florus F <sub>1</sub>	73.3	6.3	14.3
6	Liza	63.3	6.9	13.4
<b>2016 (Set-I)</b>				
1	Kheera Local (Check)	75.6	4.6	17.1
2	Badshah	77.8	8.7	16.5
3	Messi F <sub>1</sub>	76.7	7.6	15.3
4	Florus F <sub>1</sub>	76.7	5.6	10.2
5	Hoosier F <sub>1</sub>	82.2	6.4	8.9
6	CU-971	81.1	5.1	8.6
<b>2016 (Set-II)</b>				
1	Kheera Local (Check)	78.9	4.9	18.0
2	Asian-I	82.2	7.0	14.6
3	Dinar F <sub>1</sub>	92.2	6.2	14.0
4	Liza	93.3	6.8	13.5
5	CU-4562	86.7	6.7	13.2
<b>2016 (Set-III)</b>				
1	Kheera Local (Check)	77.8	5.0	15.4
2	Karizma	74.4	3.9	11.6
3	Dania 730 F <sub>1</sub>	84.4	4.4	8.3
4	Vella F <sub>1</sub>	95.6	3.6	7.0
5	Spider F <sub>1</sub>	91.1	4.5	6.9
6	Zoro F <sub>1</sub>	86.7	4.7	6.9
<b>2016 (Set - IV)</b>				
1	Kheera Local (Check)	71.1	3.3	8.7
2	Sunshine F <sub>1</sub>	74.4	4.3	5.9
3	Lina F <sub>1</sub>	94.4	3.2	5.2
4	Proton F <sub>1</sub>	78.9	3.0	4.5
5	Honey AB	66.7	3.6	3.3

Local showed higher yield than other commercial varieties. The data (Table 4) showed that Kheera Local produced higher yield i.e. 17.1 t in set I, 18.0 t in set-II and 15.4 t ha<sup>-1</sup> in set-III than other varieties. In set-IV it also gave comparable yield of 8.7 t ha<sup>-1</sup>. Its germination percentage varies from 71.7 to 78.9%. The results depicted that the new variety showed better performance than checks, and it is the only approved variety of cucumber in Pakistan.

### Pathological studies

Pathological studies were carried out at VRI and Plant Pathological Research Institute, AARI, Faisalabad. The results depicted that no serious disease was recorded on Kheera Local. Major diseases of cucumber are powdery mildew, downy mildew and collar rot. Kheera Local proved to be tolerant to high temperature and downy mildew. It is also moderately resistant to collar rot.

### Entomological studies

No serious insect/pest on Kheera Local was recorded at Entomological Research Institute, Faisalabad.

Some minor attack of leaf miner, fruit fly and whitefly was observed. Negligible attack of jassid, thrips and mites was also observed on this variety (Table 5).

**Table 5. Entomological studies on Kheera Local at Faisalabad against insect pests for the year of 2017**

S. No.	Insect/Pest	Infestation
1.	Leaf miner (%)	14.00
2.	Fruitfly(%)	4.44
3.	Whitefly/leaf	3.96
4.	Mites/leaf	Negligible
5.	Mites/leaf	Negligible
6.	Mites/leaf	Negligible

**Table 6. Performance of Kheera local at different Plant spacings at Agronomic Research Institute, Faisalabad during 2015.**

S. No.	Plant spacing	Fruit yield (t ha <sup>-1</sup> )
1.	30 (cm) (1ft)	14.48
2.	45 (cm) (1.5ft)	11.67
3.	60 (cm) (2ft)	9.07
LSD (0.05)		2.43

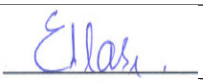


### Botanical description of Kheera Local

<b>Adult plant</b>	
Plant growth habit	Prostrate
Stem hairiness	Medium
Leaf colour	Green
Leaf lobes	Shallow
<b>Flower</b>	
Average flowering days	40 – 45 days
Flower colour	Yellow
Stigma colour	Light yellow
<b>Fruit</b>	
Fruit skin colour (at vegetative stage)	Light green with green and yellowish brown spots
Fruit surface	Rough with partly brown short spines
Fruit length (cm)	13-18
Germination %	70-80
Fruit shape	Long
Average fruit yield	14.0 t ha <sup>-1</sup>
Potential fruit yield	18.0 t ha <sup>-1</sup>
<b>Seed</b>	
Seed colour	Creamy white
Seed shape	Narrow elliptic
Average 1000-seed weight	26.0 - 30.0 g

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**CONTRIBUTION OF AUTHORS**

S. No.	Name of author	Contribution	Signatures
1.	Etlas Amin	Reviewed the literature, and write up of the manuscript	
2.	Muhammad Muzaffar Raza	Data recording and data analysis of yield and related parameters. Recorded morphological and quantitative traits	
3.	Muhammad Iqbal	Conducted evaluation trials. Data recording and data analysis of yield and related parameters. Recorded morphological and quantitative traits	
4.	Muhammad Najeebullah	Supervised research work	