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### Evaluation of genotypes for yield, quality traits and leaf curl virus resistance in chilli (*Capsicum annum* L.)

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**Abstract**

A field study was carried out during *kharif* 2017-18 at College of Horticulture, Venkataramannagudem with 53 genotypes in a randomized block design with three replications to estimate the yield, quality traits and *Chilli leaf curl virus* resistance in chilli (*Capsicum annum* L.). The analysis of variance revealed significant differences among the genotypes for all the characters indicating the presence of genetic variability among the genotypes. Among fifty three genotypes, the genotype IHR 4611 was found maximum dry yield per plant, whereas, the genotype IHR1485 recorded for fresh to dry recovery. The genotype Bhut Jolokia was found maximum for capsaicin content, IHR 4600 recorded maximum for oleoresin content, IHR 4031 found maximum for high ascorbic acid, IHR 4612 recorded for high color value, whereas, two genotypes *viz.*, IHR 1485 and IHR 4597 were found for resistant to *Chilli leaf curl virus*. The breeders can make use of them in the production of cultivars with outstanding yield, quality and resistance traits.

**Keywords:** *Capsicum annum*, chilli, yield, quality, resistance

**Introduction**

Chili pepper belongs to the crops that are cultivated throughout the world for their nutraceutical (nutritional and medicinal) and economic value (Rahman *et al.*, 2013) [23]. Member of the solanaceae family, chili pepper (*Capsicum annum* L.) is reported to be rich in proteins, lipids, fibers, mineral salts (Ca, P, Fe, K), vitamins (A, D3, E, C, K, B2 and B12) and in capsaicin (Chigoziri and Ekefan, 2013) [4]. Fresh green chili pepper contains more vitamin C than citrus fruits and fresh red chili pepper has more vitamin A than carrots (Chigoziri and Ekefan, 2013) [4]. Chili pepper is also suitable for the diets of the obese and is useful in the control of cancer of the stomach and colon (Dang *et al.*, 2014). Chili pepper fruits are low in sodium and free cholesterol (Chigoziri and Ekefan, 2013) [4] and are used in sauces, soups, stews and generally as a flavoring agent (Reyes Escogido *et al.*, 2011) [26].

Hot peppers are popular food in many parts of the world for their sensory attributes pungency and aroma. Most parts of the world, pungency increases the acceptance of the insipid basic nutrient foods (Bosland 1999) [3]. In, Tunisia Hot peppers (*Capsicum annum* L.) are widely produced and consumed as raw, cooked, or processed products. The consumption of hot peppers is due mainly to their very pungent flavor. Pungency is a key characteristic associated with members of the genus *Capsicum* and is also an important fruit quality attribute (Jarret *et al.*, 2007) [10]. The pungency is caused by capsaicinoids, and among the most abundant of these components are capsaicin (trans-8 methyl-N-vanillyl-6-nonenamide) and dihydrocapsaicin (8 methyl- Nvanilly Inonanamide), which are responsible for about 90% of total pungency (Ravishankar *et al.* 2003) [24]. The amount of capsaicin in hot peppers varies very significantly between varieties, and is measured in Scoville Heat Units (SHU). Colour of ground paprika represents its main quality attribute. It is a kind of dark-red colourful oil liquid, a fine food colour with good mobility. It is light-resistant, heat-resistant, acid-resistant, and alkali-resistant and will not be affected by metal ion. It will be soluble in oil and ethanol. With special processing, it can be soluble in water. More than 20 different pigments from paprika fruits have been identified (Deli *et al.*, 2001) [6] green chlorophylls, yellowish orange lutein, zeaxanthin, violaxanthin, antheraxanthin,  $\beta$ -cryptoxanthin and  $\beta$ -carotene. Red capsanthin, capsorubin and cryptoxanthin are characteristic exclusively for the genus *Capsicum* and are the

main pigments that determine the colour of red pepper.  $\beta$ -,  $\alpha$ -,  $\gamma$ -carotene and  $\beta$ cryptoxanthin have provitamin activity. A number of investigations revealed that carotenoid rich diet lowers the risk from some degenerative disorders, including different kinds of cancer, cardiovascular and ophthalmologic disorders. Red paprika is a fruit rich in antioxidants. (Howard *et al.*, 2000<sup>[9]</sup>; Marin *et al.*, 2004)<sup>[17]</sup>.

The *Chilli leaf curl virus* (ChLCV) disease on chilli was first reported in Pakistan by Shih *et al.* (2003)<sup>[29]</sup> and in India by Senanayake *et al.* (2006)<sup>[28]</sup>. Until the last decade, the major control measure employed against ChLCV was intensive use of insecticides targeting the vector whitefly. However, now efforts are underway to develop ChLCV resistant chilli varieties/F<sub>1</sub> hybrids suitable for commercial cultivation. Due to its increasing problem in chilli cultivation, there is a strong need to identify the sources for resistance to the virus occurring in major chilli growing areas of Andhra Pradesh.

Keeping in view the above facts, the present investigation was undertaken to observe the performance of genotypes of chilli yield, quality and resistance traits to screen the best

performing genotypes for utilization in further breeding programme.

### Materials and Methods

The experiment was carried out with 53 chilli genotypes (Table 1) at Collage of Horticulture, Venkataramannagudem, Dr. YSR Horticultural University, Andhra Pradesh, India during 2017-2018 in a randomized block design with three replications. Each genotype was raised in 3.6 m  $\times$  1.8 m plot size with a spacing of 60  $\times$  45 cm accommodating 24 plants per plot. The crop was grown with standard package of practices. Five competitive plants were selected at random for recording the observations on eight characters *viz.*, dry fruit yield per plant (g), fresh to dry recovery (%), capsaicin content (%), oleoresin content (%), ascorbic acid content (mg/100g), colour value (ASTA), ChLCV disease incidence (%) and disease severity (%). The crop was raised as per the recommended package of practices. Analysis of variance was carried out as per the procedure given by Panse and Sukhatme (1985)<sup>[20]</sup>.

**Table 1:** Germplasm accessions of chilli (*Capsicum annuum* L.)

Treatments	Accession number or Varieties	Source
T <sub>1</sub>	IHR 1485	Indian Institute of Horticultural Research, Bengaluru
T <sub>2</sub>	IHR 1732	IIHR, Bengaluru
T <sub>3</sub>	IHR 2452	IIHR, Bengaluru
T <sub>4</sub>	IHR 2596	IIHR, Bengaluru
T <sub>5</sub>	IHR 2900	IIHR, Bengaluru
T <sub>6</sub>	IHR 3014	IIHR, Bengaluru
T <sub>7</sub>	IHR 3024	IIHR, Bengaluru
T <sub>8</sub>	IHR 3310	IIHR, Bengaluru
T <sub>9</sub>	IHR 3315	IIHR, Bengaluru
T <sub>10</sub>	IHR 3443	IIHR, Bengaluru
T <sub>11</sub>	IHR 3447	IIHR, Bengaluru
T <sub>12</sub>	IHR 3448	IIHR, Bengaluru
T <sub>13</sub>	IHR 3449	IIHR, Bengaluru
T <sub>14</sub>	IHR 3455	IIHR, Bengaluru
T <sub>15</sub>	IHR 3478	IIHR, Bengaluru
T <sub>16</sub>	IHR 3517	IIHR, Bengaluru
T <sub>17</sub>	IHR 3587	IIHR, Bengaluru
T <sub>18</sub>	IHR 3915	IIHR, Bengaluru
T <sub>19</sub>	IHR 4597	IIHR, Bengaluru
T <sub>20</sub>	IHR 4595	IIHR, Bengaluru
T <sub>21</sub>	IHR 4598	IIHR, Bengaluru
T <sub>22</sub>	IHR 4600	IIHR, Bengaluru
T <sub>23</sub>	IHR 4601	IIHR, Bengaluru
T <sub>24</sub>	IHR 4602	IIHR, Bengaluru
T <sub>25</sub>	IHR 4603	IIHR, Bengaluru
T <sub>26</sub>	IHR 4604	IIHR, Bengaluru
T <sub>27</sub>	IHR 4605	IIHR, Bengaluru
T <sub>28</sub>	IHR 4606	IIHR, Bengaluru
T <sub>29</sub>	IHR 4607	IIHR, Bengaluru
T <sub>30</sub>	IHR 4608	IIHR, Bengaluru
T <sub>31</sub>	IHR 4609	IIHR, Bengaluru
T <sub>32</sub>	IHR 4610	IIHR, Bengaluru
T <sub>33</sub>	IHR 4611	IIHR, Bengaluru
T <sub>34</sub>	IHR 4612	IIHR, Bengaluru
T <sub>35</sub>	IHR 4031	IIHR, Bengaluru
T <sub>36</sub>	IHR 4516	IIHR, Bengaluru
T <sub>37</sub>	IHR 4592	IIHR, Bengaluru
T <sub>38</sub>	IHR 4593	IIHR, Bengaluru
T <sub>39</sub>	IHR 4594	IIHR, Bengaluru
T <sub>40</sub>	G3	Horticultural Research Station, Lam, Guntur
T <sub>41</sub>	G4	HRS, Lam, Guntur
T <sub>42</sub>	G5	HRS, Lam, Guntur
T <sub>43</sub>	LCA 206	HRS, Lam, Guntur
T <sub>44</sub>	LCA 235	HRS, Lam, Guntur

T <sub>45</sub>	LCA 305	HRS, Lam, Guntur
T <sub>46</sub>	LCA 334	HRS, Lam, Guntur
T <sub>47</sub>	LCA 353	HRS, Lam, Guntur
T <sub>48</sub>	LCA 620	HRS, Lam, Guntur
T <sub>49</sub>	LCA 625	HRS, Lam, Guntur
T <sub>50</sub>	LCA 960	HRS, Lam, Guntur
T <sub>51</sub>	Bhujolokia	Tura, Meghalaya
T <sub>52</sub>	Meghalaya Local	Tura, Meghalaya
T <sub>53</sub>	California Wonder	Namdhari Seed Company

### Fresh to dry recovery (%)

Fresh to dry recovery was expressed in percentage as per the following formula

$$\text{Fresh to dry recovery (\%)} = \frac{\text{Weight of dried fruits}}{\text{Weight of fresh fruits}} \times 100$$

### Capsaicin content (%)

Capsaicin content of different accessions was determined by Folin-Dennis method. The pungent principle reacts with Folin-Dennis reagent to give a blue coloured complex which is estimated colorimetrically (Mathew *et al.*, 1971) [18].

### Oleoresin content (%)

Oleoresin in chilli was extracted in a Soxhlet's apparatus using solvent acetone (Sadasivam and Manickam, 1992) [27]. Yield of oleoresin on dry weight basis was calculated using the following formula

$$\text{Oleoresin (\%)} = \frac{\text{Weight of oleoresin}}{\text{Weight of sample}} \times 100$$

### Ascorbic acid content (mg/100g)

Ascorbic acid content of fruit was estimated by 2, 6-

dichlorophenol indophenol dye method (Sadasivam and Manickam, 1992) [27].

Ascorbic acid content of the sample was calculated using the following formula

$$\text{Amount of ascorbic acid in mg/100g sample} = \frac{0.5 \times V_2 \times 100}{V_1 \times 5 \times \text{Weight of sample}} \times 100$$

### Colour value (ASTA units)

Total extractable colour of fruits measured in ASTA (American Spice Trade Association) units was determined using the procedure outlined by ASTA (1986) [1].

ASTA colour units were calculated as per the formula given below,

$$\text{ASTA} = \frac{\text{Absorbance at 460nm} \times 16.4}{\text{Weight of sample in grams}}$$

### Disease incidence and severity of Chilli leaf curl virus (ChLCV)

The variables measured are disease incidence and severity for the different lines tested. Scales for classifying the lines tested for leaf curl disease reactions were adopted as developed by Banerjee and Kalloo, 1987 [2] and used by Kumar *et al.* (2006) [15].

Scales	Symptoms
0	No symptom
1	0 to 5% curling and clearing of upper leaves.
2	6 to 25% curling, clearing of leaves and swelling of veins.
3	26 to 50% curling puckering, yellowing of leaves and swelling of veins.
4	51 to 75% leaf curling and stunted plant growth and blistering of internodes.
5	More than 75% curling and deformed small leaves, stunted plant growth with small flowers and no or small fruit set.

### Disease incidence

$$\text{Incidence (\%)} = \frac{\text{Number of infected plants}}{\text{Total number of plants assessed}} \times 100$$

### Disease severity

$$\text{Severity (\%)} = \frac{\text{Sum of grades of plant} \times 100}{\text{Total number of plants assessed} \times \text{Maximum damage category}}$$

Grouping of genotypes based on disease incidence after infection according to Reddy *et al.*, 2001 [25].

0% – Immune,

1–10% - Highly resistant,

11–25% - Resistant,

26–40% - Moderately resistant,

41–60% - Susceptible and

>60% - Highly susceptible

### Results and Discussion

The analysis of variance (Table 2) revealed significant differences among the genotypes for all the ten characters studied indicating the presence of genetic variability in the

genotypes and considerable scope for their improvement. These results are in conformity with earlier reports of Suryakumari *et al.* (2010) [32] and Kumar *et al.* (2012) [13] in chilli.

Range of dry fruit yield per plant varied from 64.67 to 312.49 g with a mean of 158.6 g (Table 3). Significantly highest dry fruit yield per plant was recorded in IHR 4611 (312.49 g) which is on par with IHR 3310 (269.49 g), while IHR 3587 (64.67 g) recorded least dry fruit yield per plant. Twenty six genotypes recorded significantly more dry fruit yield compared to overall grand mean. Suryakumari *et al.* (2010) [32] and Kumar *et al.* (2012) [13] were also observed wider range of variation between the genotypes studied.

Fresh to dry recovery varied from 19.87 to 36.33 per cent with a mean of 28.19 per cent. Highest fresh to dry recovery was recorded in IHR 1485 (36.33%) followed by IHR 3310 (34.13%), whereas, the lowest fresh to dry recovery was recorded in California Wonder (19.87%). Thirty one genotypes recorded significantly more percentage of fresh to dry recovery compared to overall mean. These results are in conformity with earlier reports of Nagaraju *et al.*, (2017) [19].

Capsaicin, the pungent principle of chilli was found to vary from 0.03 to 1.84 per cent with an average of 0.31 percent.

Bhut Jolokia (1.84%) recorded the highest capsaicin content and the lowest capsaicin content was observed in IHR 3478 (0.03%). Seventeen genotypes recorded more capsaicin content than overall grand mean. This variation could probably be due to the presence of gene modifying factors for pungency and the ratio of placental tissue to seed and pericarp by Sreelathakumary, 2000. Such variation was also reported by Prasath and Ponnuswami (2008) [21].

The current investigation revealed considerable variation for oleoresin from 6.80 to 17.75 per cent with an average of 11.10 per cent. Highest percentage of oleoresin content was recorded in IHR 4600 (17.75%) followed by IHR 2900 (15.59%), whereas the lowest percentage of oleoresin content was recorded in Meghalaya Local (6.80%). Twenty six genotypes recorded significantly more percentage of oleoresin content compared to overall mean. This was in agreement with the results obtained by Jyothi *et al.*, (2008) [11].

The nutritive value of chilli is largely determined by the content of ascorbic acid. The variation of ascorbic acid content was from 22.22 to 198.88 mg/100g with an overall mean of 93.83 mg/100g. Highest ascorbic acid content was recorded in IHR 4031 (198.88 mg/100g), followed by LCA 334 (195.56 mg/100g) and LCA 305 (191.11mg/100g), whereas the ascorbic acid content recorded in IHR 4606 (22.22 mg/100g) was the lowest. Twenty two genotypes recorded significantly more fruit length than overall mean. Such wide variation was also reported by Kumar *et al.*, (2003) [12] and Nagaraju *et al.*, (2017) [19].

Range of colour value varied from 36.60 to 280.88 ASTA with a mean of 102.52 ASTA. Highest colour value was

recorded in IHR 4612 (280.88 ASTA) followed by IHR 3449 (227.97ASTA), IHR 4603 (198.35 ASTA), IHR 4604 (187.64 ASTA) and IHR 3455 (177.46 ASTA), while IHR 4597 (36.60ASTA) recorded the lowest colour value. Twenty one genotypes recorded significantly more colour value over the grand mean. Such wide variation was also reported by Prasath *et al.* (2007) [22] and Nagaraju *et al.* (2017) [19].

Out of fifty three genotypes evaluated under natural epiphytotic conditions for disease incidence of *Chilli leaf curl virus* (ChLCV), lowest ChLCV disease incidence was observed in two genotypes, whereas, the highest percentage of ChLCV disease incidence was observed in forty seven genotypes.

Among the genotypes, none of the genotypes recorded zero per cent ChLCV disease incidence in field, two genotypes (IHR 1485 and IHR 4597) recorded between 1-10 per cent (Table 4, Plate 1 and Plate 2), none of the genotypes recorded disease incidence between 11-25 percent and 26-40 per cent, two genotypes (IHR 4593 and IHR Meghalaya Local) recorded between 41-60 per cent and forty seven genotypes recorded more than 61 percent disease incidence under natural field conditions. Out of fifty three genotypes studied, very low disease severity was observed in two genotypes *viz.*, IHR 1485 (0.67%) and IHR 4597 (0.67%), whereas the highest disease severity was observed in California Wonder (86.00%). Mali *et al.* (2006) [16], Kumar *et al.* (2006) [15], Kumar *et al.* (2011) [13], Dhaliwal *et al.* (2013) [7], Dhaliwal *et al.* (2015) [8], Srivastava *et al.* (2017) [31] were reported resistance genotypes against *Chilli leaf curl virus* disease earlier.

**Table 2:** Analysis of variance for yield, quality and ChLCV disease incidence in chilli

S. No	Character	Mean sum of Squares		
		Replications	Treatments	Error
1.	Dry fruit yield per plant (g)	1144.87	6320.75 **	1502.76
2.	Fresh to dry recovery (%)	0.58	37.53 **	0.30
3.	Capsaicin content (%)	0.00	0.18 **	0.00
4.	Oleoresin content (%)	0.35	16.83 **	0.18
5.	Ascorbic acid content (mg/100g)	49.88	6718.75 **	21.65
6.	Colour value (ASTA units)	29.57	6589.61 **	26.99
7.	ChLCV disease incidence (%)	29.24	965.32 **	23.45
8.	Disease severity (%)	10.49	847.14 **	9.38

\* Significant at 5% level

\*\* Significant at 1% level

**Table 3:** Mean performance of yield, quality and disease resistance traits of various chilli genotypes

T. No	Genotypes	Dry fruit yield (g/plant)	Fresh to dry recovery (%)	Capsaicin content (%)	Oleoresin content (%)	Ascorbic content (mg/100g)	Colour value (ASTA)	ChLCV disease incidence (%)	ChLCV Disease severity (%)
T <sub>1</sub>	IHR 1485	192.89	36.33	0.40	14.72	49.07	95.21	6.14 (14.35)	0.67
T <sub>2</sub>	IHR 1732	172.68	26.33	0.35	12.27	42.89	98.23	70.78 (57.28)	31.33
T <sub>3</sub>	IHR 2452	102.00	31.20	0.27	9.20	68.89	79.14	90.00 (71.57)	36.00
T <sub>4</sub>	IHR 2596	120.64	27.33	0.22	10.38	113.33	54.43	90.00 (71.57)	46.67
T <sub>5</sub>	IHR 2900	193.36	30.80	0.36	15.59	73.33	71.22	90.00 (71.57)	52.00
T <sub>6</sub>	IHR 3014	113.14	33.67	0.35	13.65	57.78	78.95	90.00 (71.57)	42.67
T <sub>7</sub>	IHR 3024	144.05	29.20	0.18	11.16	142.22	106.79	90.00 (71.57)	60.00
T <sub>8</sub>	IHR 3310	269.49	34.13	0.30	10.16	66.67	151.12	63.85 (53.04)	34.00
T <sub>9</sub>	IHR 3315	173.41	28.47	0.23	7.98	48.89	73.54	90.00 (71.57)	49.33
T <sub>10</sub>	IHR 3443	150.83	29.13	0.13	10.20	75.56	44.04	90.00 (71.57)	44.67
T <sub>11</sub>	IHR 3447	157.31	31.47	0.32	11.13	57.78	100.41	90.00 (71.57)	42.67
T <sub>12</sub>	IHR 3448	159.46	31.20	0.35	8.49	77.78	55.82	90.00 (71.57)	58.67
T <sub>13</sub>	IHR 3449	145.27	30.73	0.25	8.05	160.00	227.97	90.00 (71.57)	53.33
T <sub>14</sub>	IHR 3455	161.47	25.47	0.10	12.24	111.11	177.46	90.00 (71.57)	78.00
T <sub>15</sub>	IHR 3478	175.06	21.00	0.03	12.27	140.00	119.50	90.00 (71.57)	62.00
T <sub>16</sub>	IHR 3517	169.71	25.87	0.26	9.28	40.00	86.66	90.00 (71.57)	56.67
T <sub>17</sub>	IHR 3587	64.67	28.20	0.26	11.79	57.78	127.34	90.00 (71.57)	65.33

T <sub>18</sub>	IHR 3915	196.78	28.87	0.29	8.40	48.89	104.29	90.00 (71.57)	52.00
T <sub>19</sub>	IHR 4597	135.61	30.00	0.45	7.28	48.89	36.60	6.14 (14.35)	0.67
T <sub>20</sub>	IHR 4595	190.58	26.00	0.28	11.47	42.22	92.24	90.00 (71.57)	68.00
T <sub>21</sub>	IHR 4598	178.43	29.07	0.29	12.09	95.55	110.31	90.00 (71.57)	59.33
T <sub>22</sub>	IHR 4600	126.45	25.47	0.10	17.75	91.11	140.64	90.00 (71.57)	64.00
T <sub>23</sub>	IHR 4601	127.36	22.47	0.10	8.81	57.78	91.20	90.00 (71.57)	61.33
T <sub>24</sub>	IHR 4602	145.80	31.67	0.39	8.12	48.89	98.01	63.43 (52.79)	30.00
T <sub>25</sub>	IHR 4603	193.73	32.80	0.21	14.05	117.78	198.35	90.00 (71.57)	48.00
T <sub>26</sub>	IHR 4604	133.57	26.33	0.17	14.35	115.56	187.64	90.00 (71.57)	58.67
T <sub>27</sub>	IHR 4605	128.98	28.27	0.26	8.26	48.89	72.36	90.00 (71.57)	64.00
T <sub>28</sub>	IHR 4606	68.51	26.00	0.25	9.48	22.22	112.48	90.00 (71.57)	64.00
T <sub>29</sub>	IHR 4607	197.98	25.87	0.29	11.51	46.66	69.68	90.00 (71.57)	58.00
T <sub>30</sub>	IHR 4608	136.48	24.63	0.21	11.00	173.33	74.65	90.00 (71.57)	60.00
T <sub>31</sub>	IHR 4609	107.43	29.00	0.22	10.50	88.89	114.78	90.00 (71.57)	62.00
T <sub>32</sub>	IHR 4610	223.90	28.33	0.29	9.25	44.44	173.95	90.00 (71.57)	64.00
T <sub>33</sub>	IHR 4611	312.49	30.73	0.31	14.86	88.89	58.04	90.00 (71.57)	56.00
T <sub>34</sub>	IHR 4612	222.53	29.00	0.37	12.40	102.22	280.88	90.00 (71.57)	64.67
T <sub>35</sub>	IHR 4031	146.16	24.33	0.26	9.65	198.88	119.00	90.00 (71.57)	66.67
T <sub>36</sub>	IHR 4516	174.62	30.87	0.27	13.04	122.22	117.29	90.00 (71.57)	54.00
T <sub>37</sub>	IHR 4592	161.43	29.33	0.29	14.00	55.56	80.25	90.00 (71.57)	61.33
T <sub>38</sub>	IHR 4593	206.89	29.20	0.34	10.87	55.55	77.73	48.85 (44.34)	22.67
T <sub>39</sub>	IHR 4594	192.98	27.33	0.28	10.82	66.67	97.63	90.00 (71.57)	54.00
T <sub>40</sub>	G3	142.04	24.80	0.35	10.26	104.44	104.68	90.00 (71.57)	78.00
T <sub>41</sub>	G4	118.36	23.47	0.25	11.90	153.33	77.44	90.00 (71.57)	76.00
T <sub>42</sub>	G5	144.12	24.00	0.26	7.43	93.33	88.25	90.00 (71.57)	54.00
T <sub>43</sub>	LCA 206	163.99	25.47	0.24	10.72	164.44	107.32	90.00 (71.57)	70.00
T <sub>44</sub>	LCA 235	99.95	27.20	0.26	12.08	64.45	87.18	90.00 (71.57)	54.00
T <sub>45</sub>	LCA 305	151.60	30.60	0.28	13.15	191.11	55.97	90.00 (71.57)	56.00
T <sub>46</sub>	LCA 334	172.72	33.87	0.19	13.12	195.56	56.52	90.00 (71.57)	60.00
T <sub>47</sub>	LCA 353	148.88	31.00	0.33	10.59	146.67	45.64	90.00 (71.57)	64.00
T <sub>48</sub>	LCA 620	215.74	31.13	0.36	13.23	168.89	65.56	90.00 (71.57)	58.00
T <sub>49</sub>	LCA 625	176.86	33.33	0.35	13.74	106.66	106.98	90.00 (71.57)	66.00
T <sub>50</sub>	LCA 960	176.25	23.47	0.26	11.36	104.45	96.39	90.00 (71.57)	64.00
T <sub>51</sub>	Bhut Jolokia	65.87	22.67	1.84	8.37	66.67	64.46	90.00 (71.57)	60.00
T <sub>52</sub>	Meghalaya Local	109.25	27.07	0.89	6.80	177.67	91.71	57.29 (49.19)	22.67
T <sub>53</sub>	California Wonder	145.95	19.87	0.06	8.87	71.11	129.70	90.00 (71.57)	86.00
	Mean	158.60	28.19	0.31	11.10	93.83	102.52	84.08	54.26
	SEm±	22.38	0.32	0.01	0.25	2.69	3.00	2.80	1.77
	C.D at 5%	62.77	0.89	0.02	0.70	7.53	8.41	7.84	4.96
	Lowest	64.67	19.87	0.03	6.80	22.22	36.60	6.14	0.66
	Highest	312.49	36.33	1.83	17.75	198.88	280.88	90.00	86.00

**Table 4:** Grouping of chilli genotypes in to different categories for *Chilli leaf curl virus* resistance

Reaction	Infection (%)	Genotypes
Immune	0	--
Highly resistant	1–10	IHR 1485 and IHR 4597
Resistant	11–25	--
Moderately resistant	26–40	--
Susceptible	41–60	IHR 4593 and Meghalaya Local
Highly susceptible	>60	IHR 1732, IHR 2452, IHR 2596, IHR 2900, IHR 3014, IHR 3024, IHR 3310, IHR 3315, IHR 3443, IHR 3447, IHR 3448, IHR 3449, IHR 3455, IHR 3478, IHR 3517, IHR3587, IHR 3915, IHR 4595, IHR 4598, IHR 4600, IHR 4601, IHR 4602, IHR 4603, IHR 4604, IHR 4605, IHR 4606, IHR 4607, IHR 4608, IHR 4609, IHR 4610, IHR 4611, IHR 4612, IHR 4031, IHR 4516, IHR 4592, IHR 4594, G3, G4, G5, LCA 206, LCA 235, LCA 305, LCA 334, LCA 353, LCA 620, LCA 625, LCA 960, Bhut Jolokia, California Wonder





T1-IHR 1485



T19-IHR 4597

**Plate 1:** *Chilli leaf curl virus* (ChLCV) resistant genotypes and their fruits



IHR 1485



IHR 4597

**Plate 2:** The two genotypes IHR 1485 and IHR 4597 showed resistant to ChLCV in field at the end of the crop

**Conclusion**

The present study indicated the availability of genotypes possessing desirable yield, quality and resistance characteristics namely, IHR 4611 for high dry yield per plant, IHR 1485 for fresh to dry recovery per plant, Bhut Jolokia for

high capsaicin content, IHR 4600 for oleoresin content, IHR 4031 for high ascorbic acid content, IHR 4612 for high color value and IHR 1485 and IHR 4597 for *Chilli leaf curl virus* resistance in chilli. The breeders can make use of them in the

production of cultivars with outstanding yield, quality and resistance attributes.

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