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EVALUATION OF CHILLI (*CAPSICUM ANNUUM* L.) GENOTYPES FOR LEAF CURL VIRUS RESISTANCE SOURCE THROUGH FIELD SCREENING

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ABSTRACT

The present investigation entitled "Evaluation of chilli (*Capsicum annuum* L.) genotypes for leaf curl virus resistance source through field screening" was carried out at the Department of Horticulture, University of Agricultural Sciences, Gandhi Krishi Vigyana Kendra, Bengaluru during 2021-22. The experimental material consisted of thirty-one genotypes of chilli and which evaluated following augmented design. Test seedlings of thirty-one genotypes were raised in portrays and fourty days aged seedlings were transplanted in main field. All the package of practices for chilli cultivation were followed. No spraying was given in overall crop period to encourage the spreading of the virus. The variables measured are disease incidence (%) and severity (%) for the different lines tested in the season. Scales for classifying the lines tested for leaf curl disease reactions were adopted as developed by Banerjee and Kalloo, 1987 and used by Kumar *et al.* (2006). Results of screening thirty-one genotypes against leaf curl virus revealed that four genotypes viz., EC 332338, IC 570408, IC362007 and Pant C1 were found resistant and these genotypes could be employed for further utilization in resistance breeding programme.

Key words : Chilli (*Capsicum annuum* L.), Genotypes, Leaf curl virus, Resistance, Disease incidence (%), Disease severity (%).

Introduction

The chilli pepper (*Capsicum annuum* L.), commonly referred to as the hot pepper is one of the main vegetable and spice crops in the *Solanaceae* family. Out of the five major domesticated species of capsicum (*C. annuum*, *C. baccatum*, *C. chinense*, *C. frutescens* and *C. pubescens*), C. *annuum* is the species most commonly grown in the world. It is classified as either non-pungent (sweet pepper) or pungent (chili/hot pepper) depending on its level of pungency (Bosland and Votava, 2000). It is a vital component of Indian daily cooking and culinary applications, and it contains vitamin A, C, E, potassium and oleoresin, which has a high potential for export. India is the largest producer, consumer and exporter of chillies in the world. India produces 35,92,000 MT of green chilies on 3,08,000 hectares of land and 21,49,000 MT of dry chilies on 7,52,000 hectares of land. In both area and production, Karnataka leads the world in green chilli production, while it ranks second in dried chilli production. (Annon, 2018).

There are 45 viruses that are known to affect chilli. There have been reports of twenty-four of them occurring naturally, while the remaining ones can spread through artificial inoculation. Eleven viruses have already been recorded from India out of the twenty-four viruses that are considered to naturally occur on chillies (Biswas *et al.*, 2013). The chilli leaf curl virus is the most harmful one overall in terms of occurrence and yield loss. The chilli leaf curl virus (ChLCV) was initially reported in by Shih *et al.* (2003) in Pakistan and Senanayake *et al.* (2006) in India. Until the last decade, the primary preventative measure used against ChLCV was intensive application of insecticides to control the vector whitefly. However, presently there are initiatives to develop ChLCV

resistant chilli varieties or F_1 hybrids suitable for commercial cultivation. Since its increasing problem in chilli cultivation, there is a strong need to identify the sources of resistance and tolerance in chilli germplasm of India.

Materials and Methods

The experiment was conducted in the Vegetable Block, Department of Horticulture, University of Agricultural Sciences, Bangalore during 2021-22. The experimental material consisted of thirty one chilli *Capsicum annuum* (L.) genotypes. Chilli seedlings were raised in portrays. Package of practices (POP) were followed as per the UHS, Bagalkot POP guidelines. Thirty five days aged seedlings were transplanted in the main field with 60 × 45 cm spacing. No spraying was given in overall crop period to encourage the spreading of the virus. The variables measured were disease incidence (%) and severity (%) for the different chilli genotypes. Scales for classifying the lines tested for leaf curl disease reactions were adopted as developed by Banerjee and Kalloo (1987) and used by Kumar *et al.* (2006).

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 (%)

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

Grouping of genotypes based on disease incidence after infection according to Reddy *et al.* (2001).

0 % – Immune,

1–10% - Highly resistant (HR)

11–25% - Resistant (R),

26–40% - Moderately resistant (HR),

41–60% - Susceptible (S)

>60% - Highly susceptible (HS)

Results and Discussion

In India, breeding for resistance in chilli started in late sixties and the strategies adopted were screening under field conditions, assessing disease incidence and disease severity. Continuous efforts to locate resistant source and utilization of the same in resistant breeding programme were imperative to manage the disease in long run. Therefore, based on 0-5 scale, screening was undertaken to evaluate thirty-one genotypes against chilli leaf curl virus in terms of disease incidence and disease severity under field conditions.

Out of thirty one genotypes, none of the genotypes recorded 0 and 1-10 per cent ChLCV disease incidence in field condition whereas four genotypes *viz.*, EC 332338 (20.00%), IC 570408 (20.00%), IC 362007 (20.00%) and Pant c1 (20.00%) recorded lowest disease incidence. Nine genotypes *viz*., IC 362026, EC 390029, EC 382017, EC 399549, IC 545729, EC 402113, EC 378632, EC 596920, IC119744 recorded between 26-40 per cent disease incidence, whereas, eleven genotypes recorded under 41-60 per cent disease incidence whereas seven

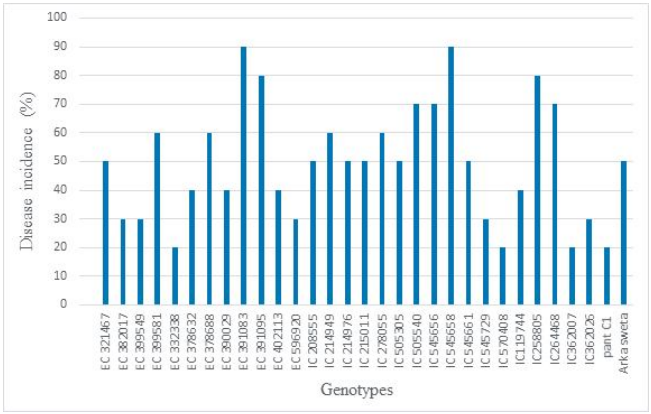

Fig. 1 : Chilli leaf curl virus disease incidence of chilli genotypes.

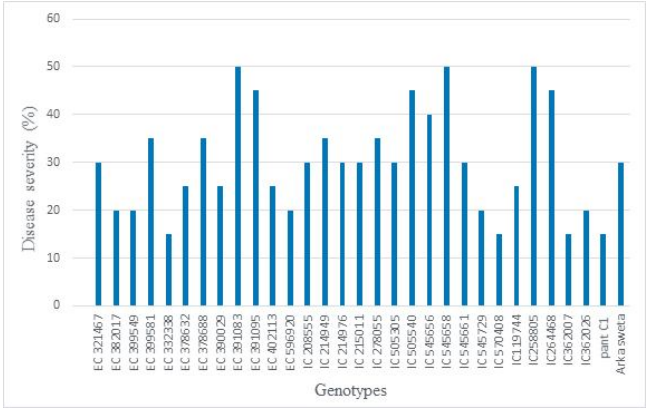

Fig. 2 : Chilli leaf curl virus disease severity of chilli

Table 1 : Response of chilli genotypes for chilli leaf curl virus under field screening.

S. no.	Genotypes	Disease incidence (%)	Disease severity (%)	Disease reaction
1	EC 321467	50.00	30.00	S
2	EC 382017	30.00	20.00	MR
3	EC 399549	30.00	20.00	MR
4	EC 399581	60.00	35.00	S
5	EC 332338	20.00	15.00	R
6	EC 378632	40.00	25.00	MR
7	EC 378688	60.00	35.00	S
8	EC 390029	40.00	25.00	MR
9	EC 391083	90.00	50.00	HS
10	EC 391095	80.00	45.00	HS
11	EC 402113	40.00	25.00	MR
12	EC 596920	30.00	20.00	MR
13	IC 208555	50.00	30.00	S
14	IC 214949	60.00	35.00	S
15	IC 214976	50.00	30.00	S
16	IC 215011	50.00	30.00	S
17	IC 278055	60.00	35.00	S
18	IC 505305	50.00	30.00	S
19	IC 505540	70.00	45.00	HS
20	IC 545656	70.00	40.00	HS
21	IC 545658	90.00	50.00	HS
22	IC 545661	50.00	30.00	S
23	IC 545729	30.00	20.00	MR
24	IC 570408	20.00	15.00	R
25	IC119744	40.00	25.00	MR
26	IC258805	80.00	50.00	HS
27	IC264468	70.00	45.00	HS
28	IC362007	20.00	15.00	R
29	IC362026	30.00	20.00	MR
30	Pant C1	20.00	15.00	R
31	Arka Sweta	50.00	30.00	S

genotypes were reported to have more than 60 per cent disease incidence.

Out of thirty one genotypes, lowest disease severity (15%) was noticed in EC 332338, IC 570408, IC362007 and Pant C1 followed by EC 382017, EC 399549, EC 596920, IC 545729, IC362026, which accounted 20 percent disease severity whereas the remaining genotypes disease severity ranged between 25 to 50 per cent.

Based on disease incidence and severity and values obtained from field screening of thirty one genotypes, none of the genotypes were immune and highly resistant to the chilli leaf curl virus. Only four genotypes viz., EC 332338, IC 570408, IC362007 and Pant C1 were grouped under resistant category, whereas, nine genotypes *viz.*, IC362026, EC 390029, EC 382017, EC 399549, IC 545729, EC 402113, EC 378632, EC 596920 and IC119744 were found moderately resistant. However, the genotypes EC 378688, EC 399581, IC 208555, EC 321467, IC 505305, IC 215011, IC 214949, IC 214976, IC 278055, IC 545661, Arka Sweta were registered under susceptible category and rest of the genotypes *viz.*, EC 391095, EC 391083, IC264468, IC258805, IC 505540, IC 545656, IC 545658 showed highly susceptible reaction against chilli leaf curl virus. Similar kind of grouping of genotypes against chilli leaf curl virus was also reported by Awasthi and Kumar (2008), Srivastava *et al.* (2015), Kumar *et al.* (2011), Naresh *et al.* (2016), Srivastava *et al.* (2017) and Hussain *et al.* (2017).

Conclusion

From the present study, it is evident that, research must be extended to identify additional genetic resources for chilli leaf curl virus (ChLCV) resistance. Germplasm collected from diversified areas and wild genotypes will be helpful in identifying useful resources for breeding purpose. Genotypes *viz.*, EC 332338, IC 570408, IC362007 and Pant C1 could be employed for further studies on resistance to chilli leaf curl virus. Need to conduct artificial inoculation experiment for screening of chilli leaf curl virus.

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