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Evaluation of capsicum hybrids against viral diseases under protected cultivation in Dharwad, Karnataka

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Abstract

Screening of capsicum hybrids were conducted under protected cultivation during *kharif* 2018 and *rabi* 2018-19. The results indicated that out of fourteen hybrids screened, none of them were found to be highly resistant, resistant and moderately resistant during both the seasons. During *kharif* 2018 out of fourteen hybrids screened, six hybrids were found to be moderately susceptible *viz.*, Maxibell, Shristika, SV1865PB, Asha, Arka Gaurav and Arka Basanti for leaf curl disease. For mild mottle disease, hybrids Arka Gaurav and Arka Basanti recorded moderately resistant reaction. However, during *rabi* 2018-19 eight hybrids *viz.*, Maxibell, Shristika, SV1865PB, Asha, Indra, Arka Gaurav, Arka Basanti and Rithal showed susceptible reaction for leaf curl disease. Whereas, eight hybrids *viz.*, Shristika, SV1865PB, Asha, Indra, Arka Gaurav, Arka Basanti, 35-160-R2 and NSX 8 recorded moderately susceptible for mosaic disease. The symptoms observed during screening included mosaic and mottling, yellow discoloration, vein clearing, leaf deformation and narrowing, stunted plant growth, reduced fruit setting and light green colour mottling symptoms on fruits.

Keywords: Capsicum hybrids, protected cultivation, leaf curl, mild mottle and mosaic diseases

Introduction

Production of vegetables under protected cultivation system results in effective use of the land resources, besides being able to increase the production of quality vegetables both for the export and domestic markets by offsetting biotic and abiotic stresses to a great extent that otherwise is prevalent in open cultivation. Under protected cultivation, capsicums are widely grown due to higher productivity and economic feasibility (Anon, 2011) [2].

Capsicum (*Capsicum annuum* L. var. *grossum* Sendt.) a member of family *Solanaceae*, is commonly known as sweet pepper, bell pepper, Shimla mirchi and green pepper. Although this genus includes 25 species, most of them are cultivated in temperate and tropical areas. In India, capsicum is extensively cultivated in states of Karnataka, Andhra Pradesh, Maharashtra, Tamil Nadu, hilly areas of Uttar Pradesh and Himachal Pradesh. In Karnataka capsicum is grown in an area of about 4.13 thousand ha with a production of about 81.67 thousand tons (Anon., 2018) [3].

About sixty eight viruses has been reported to be infecting capsicum from different parts of the world in terms of host range, frequency of distribution and damage (Pernezny *et al.*, 2003) [11]. Diseases of viral nature affect production significantly, both in terms of yield and quality for export and domestic market (Nono-Womdin and Atibalentjia, 1993) [10]. Majority of pepper viruses are reported to be transmitted by aphids, thrips, leafhoppers, beetles and fungi or by contact and through the soil and some are transmitted by nematodes (Green and Kim, 1991) [8]. Observation showed that the production of this crop has been banned with viral infection. Viral diseases are the major limiting factors for successful pepper cultivation in the world (Francki, 1979; Fujisawa *et al.*, 1986; Florini and Zitter, 1987) [6, 7, 5].

In Karnataka, capsicum cultivation under protected conditions drawing more attention towards farmers in peri-urban production system, because of easy access to the market. The popularization of polyhouse venture and use of hybrid seeds has led to the escalated incidence of the viral disease in the state. Hence, host plant resistance is considered as most practicable, feasible and an economical method of plant disease management.

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So there is a need to identify resistant source in capsicum through screening of available hybrids against viral disease under protected cultivation.

In view of the above facts the present study was conducted to investigate the severity of viral diseases of capsicum in mostly cultivated hybrids in Karnataka under protected conditions and to know the resistant nature against viral diseases. To achieve these goals, fourteen different hybrids were selected which are cultivated year around under protected conditions.

Material and Methods

In the present study fourteen capsicum hybrids from different private companies collected and used for screening against

viral diseases under protected structures at Hi-tech Horticulture Unit, Saidapur farm, UAS, Dharwad during *kharif* 2018 under polyhouse and *rabi* 2018-19 under shade net. The seeds were sown in the nursery and normal agronomic practices were followed to ensure proper plant growth. Forty five days old seedlings were transplanted in the main field. Indra cultivar was used as susceptible check. Each entry was sown in two rows of 6 m length with a spacing of 45 cm from plant to plant and 60 cm between rows. Regular package of practices were carried out until harvest of the crop. Disease rating scale used to determine the level of resistance or susceptibility of capsicum hybrids against viral diseases as given by Bashir *et al.* (2005)^[4].

Disease severity Index	Percentage of infection	Host reaction
0	Free from infection	HR (Highly resistant)
1	1-10% infection	R (Resistant)
2	11-20% infection	MR (Moderately resistant)
3	21-30% infection	MS (Moderately susceptible)
4	30-50% infection	S (Susceptible)
5	More than 50% infection	HS (Highly susceptible)

Results and Discussion

Symptoms observed on different hybrids included, leaf curl viruses infected capsicum plants exhibited yellowing and mosaic in younger leaves followed by blistering of leaves, upward curling of leaf lamina, leaf distortion and crumpling. Mild mottle virus infected plants showed mild mottling, deformed leaves, yellow or green mosaic and chlorosis of leaves.

Mosaic virus infected sweet pepper plants showed mixed symptoms of mosaic, mottling, yellow discoloration, vein clearing, leaf deformation and narrowing of petiole, stunted growth, reduced fruit setting and light green colour, mottling, chlorotic rings on fruits.

Screening during *kharif* 2018: The disease severity of viral diseases of capsicum was recorded at 30, 60, 90, 120 and 150 days after transplanting (DAT). There was no disease at 30 DAT in any of the genotypes. However, disease severity increased with increase in age of the crop from 30-150 DAT. Out of fourteen hybrids screened, none of them were found to be highly resistant, resistant and moderately resistant. Six hybrids were found to be moderately susceptible *viz.*, Maxibell, Shristika, SV1865PB, Asha, Arka Gaurav and Arka Basanti. Three hybrids, Indra, Rithal, and Sympathy were recorded susceptible, whereas, five hybrids 35-160-R2, NSX 8, SPH-20, SPH-82, NS-292 were found to be highly susceptible for leaf curl disease.

For mild mottle disease, hybrids Arka Gaurav and Arka Basanti recorded moderately resistant reaction. Whereas, Maxibell, Shristika, SV1865PB, Asha, Indra, Rithal and Sympathy showed moderately susceptible reaction. Hybrids 35-160-R2, NSX 8 and SPH-20 were found to be susceptible.

Hybrids, SPH-82 and NS-292 recorded highly susceptible reaction to the virus.

Screening during *rabi* 2018-19: Eight hybrids *viz.*, Maxibell, Shristika, SV1865PB, Asha, Indra, Arka Gaurav, Arka Basanti and Rithal showed susceptible reaction. Whereas, six hybrids *i.e.*, Sympathy, 35-160-R2, NSX 8, SPH-20, SPH-82 and NS-292 were found to be highly susceptible to the leaf curl disease. Whereas, eight hybrids *viz.*, Shristika, SV1865PB, Asha, Indra, Arka Gaurav, Arka Basanti, 35-160-R2 and NSX 8 recorded moderately susceptible reaction with disease severity index of 3. Hybrids, Maxibell, Rithal, Sympathy, SPH-20, SPH-82 and NS-292 were found to be susceptible to the mosaic disease. All the 14 capsicum hybrids were further categorized into different groups based on the type of disease reaction (Table 1).

Screening of capsicum hybrids were conducted under protected cultivation during *kharif* 2018 and *rabi* 2018-19. The results indicated that out of fourteen hybrids screened, none of them were found to be highly resistant, resistant and moderately resistant during both the seasons. The results are confirmatory with Naresh *et al.* (2016)^[9] screened fifty pepper genotypes for ChiVMV and CMV by mechanical sap inoculation. Symptoms of severe leaf distortion and chlorotic lesions were observed for CMV, among the genotypes eight genotypes showed immune and highly resistant, five were resistant and two showed moderately resistant reaction. Similarly Anjaneya Reddy *et al.* (2007)^[11] screened 50 tomato genotypes for the disease incidence of To LCV. Out of 50 genotypes, none of the tested lines were resistant; however, six genotypes showed mild infection and nine genotypes were found to be moderately resistant.

Table 1: Disease reaction of capsicum hybrids screened against viral diseases under protected condition

Sl. No.	Disease severity index	Percentage of infection	Disease reaction	<i>Kharif</i> 2018		<i>Rabi</i> 2018-19	
				Leaf curl disease	Mild mottle disease	Leaf curl disease	Mosaic disease
1	0	Free from infection	HR (Highly resistant)	-	-	-	-
2	1	1-10% infection	R (Resistant)	-	-	-	-
3	2	11-20% infection	MR (Moderately resistant)	-	Arka Gaurav, Arka Basanti	-	-
4	3	21-30%	MS (Moderately	Maxibell, Shristika,	Maxibell, Shristika,	-	Shristika, SV1865PB,

		infection	susceptible)	SV1865PB, Asha, Arka Gaurav, Arka Basanti	SV1865PB, Asha, Indra, Rithal, Sympathy		Asha, Indra, Arka Gaurav, Arka Basanti, 35-160-R2, NSX 8
5	4	30-50% infection	S (Susceptible)	Indra, Rithal, Sympathy	35-160-R2, NSX 8, SPH-20	Maxibell, Shristika, SV1865PB, Asha, Indra, Arka Gaurav, Arka Basanti, Rithal,	Maxibell, Rithal, Sympathy, SPH-20, SPH-82, NS-292
6	5	More than 50% infection	HS (Highly susceptible)	35-160-R2, NSX 8, SPH-20, SPH-82, NS-292	SPH-82, NS-292	Sympathy, 35-160-R2, NSX 8, SPH-20, SPH-82, NS-292	-

Conclusion

In the present investigation none of the capsicum hybrids showed highly resistant, resistant or moderately resistant reaction. The plausible answer may be the warm humid conditions and, an excellent stable environment for pest development. The natural enemies that keep pests under control outside are not present under protected conditions.

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