

RESEARCH NOTE

Evaluation of capsicum genotypes for resistance to powdery mildew under protected cultivation

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An experiment was conducted on evaluation of capsicum genotypes for resistance to powdery mildew caused by *Leveillula taurica* under protected cultivation at Hi-tech Horticulture Unit, Saidapur Farm, University of Agricultural Sciences, Dharwad, Karnataka during the year 2015-16 under protected cultivation. Results revealed that, among fourteen genotypes screened, none of them were found to be immune, highly resistant and resistant. Three genotypes were found to be moderately resistant viz., Bachata, Inspiration and Capsicum Purple. While four genotypes were found to be moderately susceptible and seven were highly susceptible. These different reactions may be due to genetic diversity exist among genotypes

Key words: Capsicum, Powdery mildew, Resistance

Capsicum (*Capsicum annuum* L. var. *grossum* Sendt.), commonly known as sweet pepper, bell pepper, shimla mirchi and green pepper belongs to family solanaceae. Although this genus includes 25 species, most of them are cultivated in temperate and tropical areas. Capsicum belongs to the species *Capsicum annuum* and it has originated in Mexico and Central America (Andrew, 1984). It was introduced to India by the Britishers in the 19th century in Shimla hills. It is the first exotic vegetable known to cultivate under protected structure. This crop has been cultivated for thousands of years, especially in temperate regions of central and south America and European countries, tropical and subtropical regions of Asian continent mainly in India and China. India contributes one fourth of world production of capsicum with an average annual production of 0.172 million tones from an area of 0.30 million hectare.

In India, capsicum is cultivated in Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Himachal Pradesh and hilly areas of Uttar Pradesh. Karnataka stands first with an area about 0.038 million hectare ha with a production of about 0.53 million tones (Anon., 2015). In Karnataka, capsicum is cultivated in most of the northern districts. However, the large scale cultivation of capsicum is concentrated in Belagavi and Haveri districts. Since capsicum is grown as green vegetable throughout the season and it is vulnerable to various diseases, insect pests and physiological disorders. The important diseases includes fusarium wilt, anthracnose, cercospora leaf spot, bacterial wilt, root knot, sting nematodes, leaf curl, pepper mottle and tobacco mosaic virus. Among these powdery mildew caused by *Leveillula taurica* (Lev.) became severe under protected cultivation and causes considerable loss.

L. taurica has wide host range viz., pepper, tomato, brinjal, onion, cotton and other crops and it has also been recorded on many wild plant species. This pathogen represents a challenge from many perspectives. Early stages of infection are difficult to diagnose; thus, the disease can rapidly spread in both field and protected cultivation. Earlier this disease was considered as a minor disease. But, in recent days it became serious problem due to change in climate, changes in package of practices and the cultivation of capsicum under protected cultivations which are much congenial for disease development in a rapid manner.

Older plants and lower leaves are the first evidences of powdery mildew infection. The fungus, *Leveillula taurica* (Lev.) infects the leaves but not the fruit or stems of pepper plants Arnaud (1921). The first sign of the disease is observed on lower surface of older leaves. Symptoms are seen as fluffy, white patches of powdery growth and gradually these patches may turn brown. The upper surface of the leaf may appear normal or have diffused. Severely infected leaves wither and drop off.

Host plant resistance is considered as most practicable, feasible and an economical method of plant disease management so there is a need to identify resistant source in capsicum through screening of available genotypes against powdery mildew disease under protected cultivation. Therefore, investigation was undertaken to find out the resistance source against the disease.

Present investigation was carried out to evaluate capsicum genotypes for their reaction towards powdery mildew caused by *Leviluula taurica* under protected cultivation. Fourteen capsicum genotypes from different private companies collected and used for screening against powdery mildew under protected structure at Hi-tech Horticulture Unit, Saidapur Farm, University of Agricultural Sciences, Dharwad by creating epiphytotic

Capsicum hybrid	Colour	Source
Bachata	Yellow	Rijk Zwaan India Seeds Pvt. Ltd.
Bomby	Red	Syngenta India Ltd.
Capsicum purple	Purple	Biocarve seeds
Doctor wonder	Green	Doctor Seeds Pvt Ltd.
Green wonder	Green	Biocarve seeds
Indra	Green	Syngenta India Ltd.
Inspiration	Red	Rijk Zwaan India Seeds Pvt. Ltd.
Krishna	Green	Pahuja seeds Pvt Ltd.
Indam mahabharat	Green	Indo-American Hybrid Seeds (India) Pvt Ltd.
Orobelle	Yellow	Syngenta India Ltd.
Orange wonder	Orange	Biocarve seeds
Red queen	Red	Biocarve seeds
Sympatty	Orange	Rijk Zwaan India Seeds Pvt. Ltd.
Yellow wonder	Yellow	Biocarve seeds

condition with an objective to identify sources of resistance. Indra cultivar was used as susceptible check. Each entry was sown in two rows of 6 m length. Artificial inoculation of *L. taurica* spores was done to create epiphytotic cultivation. Capsicum genotypes used for screening with source are given below:

Score	Description
0	No symptom of powdery mildew on leaves
1	Small scattered powdery mildew specks covering 1 per cent or less leaf area
3	Small powdery lesions covering 1-10 per cent of leaf area
5	Powdery lesions enlarged covering 11-25 per cent of leaf area
7	Powdery lesions coalesce to form big patches covering 26-50 per cent leaf area
9	Big powdery patches covering 51 per cent or more of leaf area and defoliation occur

Further these fourteen genotypes were further grouped into six categories based on reaction type as given by Khare and Lakpale (1997).

Grade	Reaction	Infection
0	Immune (I)	No disease
1	Highly resistant (HR)	Up to 1 per cent
3	Resistant (R)	1-10 per cent
5	Moderately resistant (MR)	11-25 per cent
7	Moderately Susceptible (MS)	26-50 per cent
9	Highly susceptible (HS)	More than 51 per cent

The disease intensity of powdery mildew disease was recorded by using 0-9 scale as given by Mayee and Datar (1986) by selecting five plants in each entry and each plant was divided into three parts as top, middle and bottom at two stages viz., powdery mildew covering half of the plant in susceptible cultivar and another at disease covering full plant.

Results indicated that, there was genetic diversity exist among the evaluated genotypes so they had shown different reaction

Table 1. Reaction of capsicum genotypes against powdery mildew caused by *Leveillula taurica* under protected cultivation (0-9 scale)

Capsicum genotypes	Per cent disease index (PDI)			Maximum disease score	Reaction
	Disease covering half part of the susceptible check	Disease covering full part of the susceptible check	Mean		
Bachata	6.89	29.36	18.13	5	MR
Bomby	25.26	78.23	51.75	9	HS
Doctor wonder	34.26	76.89	55.58	9	HS
Green wonder	22.30	46.90	34.60	7	MS
Indra	58.30	98.26	78.28	9	HS
Inspiration	9.36	33.34	21.35	5	MR
Krishna	18.63	63.22	40.93	7	MS
Indam Mahabharat	16.90	50.62	33.76	7	MS
Orobelle	36.73	89.30	63.02	9	HS
Orange wonder	53.20	79.42	66.31	9	HS
Capsicum purple	12.33	26.70	19.52	5	MR
Red queen	48.36	83.97	66.17	9	HS
Sympatty	12.30	42.89	27.60	7	MS
Yellow wonder	38.93	78.85	58.89	9	HS

Table 2. Reaction of capsicum genotypes against powdery mildew caused by *Leveillula taurica* under protected cultivation

Grade	Reaction	Per cent infection	Entries	No. of genotypes
0	I	0	Nil	0
1	HR	Up to 1	Nil	0
3	R	1-10	Nil	0
5	MR	11-25	Bachata, Inspiration and Capsicum Purple.	3
7	MS	26-50	Krishna, Indam Mahabharata, Green wonder and Sympatty.	4
9	HS	More than 51	Bomby, Doctor wonder, Indra, Orobelle, Orange wonder, Red queen and Yellow wonder.	7
I	: Immune		MR : Moderately resistant	
HR	: Highly resistant		MS : Moderately susceptible	
R	: Resistant		HS : Highly susceptible	

(Table 2). Among fourteen genotypes screened, none of them were found to be immune, highly resistant and resistant. Three genotypes were found to be moderately resistant viz., Bachata, Inspiration and Capsicum Purple. While four genotypes were found to be moderately susceptible and seven were highly susceptible (Table 2). This type of reaction offered by different genotypes may be due to their genomic constitution.

Several researcher reported different chilli genotypes and categorised based on their reaction against powdery mildew but very less work with capsicum have been reported and the results are in conformity with Rajesh and Mohrir (2015), Sharmila *et al.* (2005), Ashtaputre (2006) and Pandravada *et al.* (2006). Several studies on *Leveillula taurica* have been carried out (Shifriss *et al.*, 1992) in India, France, Israel and USA, describes availability of promising source of *L. taurica* resistance cultivars which can be used to incorporate into Mediterranean pepper cultivars and suggested that full resistance depends on three pairs of genes.

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