Eco. Env. & Cons. 29 (July Special Issue– Int. Seminar Env. Issues and Sustainable Development, Durg, 2–3, Feb., 2023): pp. (S35-S38)

ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2023.v29isp1.010

Screening for chilli genotypes against anthracnose (*Colletotrichum capsici*)

J. Srinivas[1], K. Ravinder Reddy[2], P. Saidaiah[3], K. Anitha[4], S.R. Pandravada[5] and M. Balram[6]

[1]Department of Vegetable Science, SKLTSHU, Mojerla, Telangana
[2]Department of Vegetable Science, SKLTSHU, Mulugu, Siddipet, Telangana
[3]Department of Genetics and Plant Breeding, SKLTSHU, Mojerla, Telangana
[4]Department of Plant Pathology, NBPGR, Regional Station, Rajendranagar, Hyderabad
[5]Department of Botany, NBPGR, Regional Station, Rajendranagar, Hyderabad
[6]Department of Genetics and Plant Breeding, PJTSAU, Warangal, Telangana

ABSTRACT

Experiments were conducted to evaluate thirty genotypes obtained from AVRDC, NBPGR Regional Station, few local varieties were also collected. They were screened against anthracnose disease under natural and artificial field conditions at college of Horticulture, Rajendranagar, during in the year 2017-18. The observation of disease severity was recorded at 145 days after transplanting. All the 30 genotypes scored grades of 3 to 4 and were found to be under natural condition was found to be 3 lines are resistance AVPP0514, AVPP9813 and PBC-81, one line in moderately resistance line was EC-334182, twenty-four lines scored the highest grade 3 thereby found to be susceptible lines and reaming 2 lines scored the highest grade 4 are highly susceptible. All the 30 genotypes scored grades of 3 to 4 and were found to be under artificial conditions three lines are in moderately resistance AVPP0514, AVPP9813 and PBC-81. Six lines scored the highest grade 3 lines are susceptible and reaming 21 lines scored the highest grade 4 are highly susceptible.

***Key words**: Chilli, Anthracnose, Colletotrichum cpasici, Genotypes, Percentage Disease Index (PDI)*

Introduction

Chilli (*Capsicum annuum* L.) is an important valuable commercial spice-cum-vegetable crop belonging to the family Solanaceae and originated in Latin American regions of New Mexico, Guatemala and Bulgaria. It is grown in India under various agro-climatic conditions *viz.*, tropical, sub-tropical and temperate climates. (Hazra *et al*., 2011).

Immature chilli fruits contain phytonutrients, ascorbic acid, carotenoids and rutin which are valued for pharmaceutical needs (Purseglove, 1977). Chillies have two important qualities; biting pungency and attractive red colour attributed to capsaicin and capsanthin, respectively. Capsaicin, a crystalline acrid volatile alkaloid present in the placenta of fruit, carries diverse prophylactic and therapeutic uses in allopathic and ayurvedic medicines.

Among the fungal diseases of chilli pepper, anthracnose or ripe fruit rot caused by *Colletotrichum* spp. is a widespread problem limiting the profitable cultivation and seed production throughout the major chilli growing regions of the world. Anthracnose pathogen infecting chilli has been reported with five different species: *C. capsici*, *C. acutatum*, *C. gloeosporioides*, *C. coccodes* and *C. dematium* (Kim *et al.*, 1986). Among the five species, *C. capsici* is the most predominant species infecting chilli crops in India.

In India, anthracnose or fruit rot caused by

[1]Assistant Professor, [2] Professor, [3]Associate Professor, [4]Principle Scientist, [5]Principle Scientist, [6]Professor & Head

Colletrotricum spp. is a devastating disease of chilli which may cause yield losses up to 50 per cent. It occurs during pre-harvest as well as post-harvest stages, causing extensive losses in yields during warm and humid conditions in tropical and sub-tropical climates. There is no released chilli cultivar in India with acquired resistance to anthracnose, especially against *C. capsici*.

Materials and Methods

Fully grown green fruits and matured ripened red fruits of thirty genotypes were chosen for this study. It is obtained from AVRDC, NBPGR Regional Station, few local varieties collected from the Warangal district of Telangana state and Dharwad district of Karnataka state. They were screened against anthracnose disease under natural and artificial field conditions at College of Horticulture, Rajendranagar, Hyderbad during the year 2017-18.

Isolation of pathogens

Anthracnose-affected chilli fruits were collected from the farmer's fields in different locations in the Adilabad, Nirmal, and Mahbubnagar Districts, Telangana, India. The pathogen was isolated from anthracnose lesions of disease-affected fruits cultured on Potato Dextrose Agar (PDA) at 25 °C for 7 days. Ten ml of sterile distilled water was added to the culture to obtain conidial suspension by scraping the conidial mass from the plate using a sterile glass slide. The conidial suspension was filtered through double-layered cheesecloth to remove mycelia and cultural debris. The conidial concentration is adjusted with sterile, distilled water using a haemocytometer. The pathogenicity of all the isolates was tested by employing fruit puncture and sprays inoculation methods under laboratory and field conditions, respectively.

Field Studies

Chilli genotypes were screened under field conditions in a randomized block design with three replications for ripened red fruits. The Mycelium of *C. Capsici* was grounded in the mortar and mixed with sterilized water to make up a liquid mixture. Spray inoculation was done by spraying a suspension of conidia (5 x 105 conidia ml-1 water) evenly onto the chilli plants bearing red fruits separately in respective plots using a hand sprayer. Un-inoculated plots served as controls. Then, the canopy of all plants was watered from next day's morning up to 1 week period by spraying water, two times per day at the morning and evening using Knapsack sprayer to stimulate conidial differentiation on fruit surfaces. Generally, under dry conditions with low relative humidity when chilli is cultivated with irrigation, the occurrence of anthracnose frequency is low. Therefore, water spraying the rom next day after artificial inoculation is an important requirement for conidial differentiation into the infective structures on the fruit surface. Finally, the number of anthracnose affected fruits was counted and the percentage incidences of anthracnose in each plot were then calculated.

Percent Diseased index (PDI)

Percent disease index (PDI) was calculated by using the following given by wheeler (1969)

$$\textbf{PDI} = \frac{\text{Sum of individual rating}}{\text{Number of fruits assessed}} \times \frac{100}{\text{Maximum disease grade}}$$

Based on PDI, genotypes were grouped into five classes such as no infection as immune; 1-5 % PDI as resistant; 6-25% PDI as moderately resistant; 26-50% PDI as susceptible and 51-100% PDI as highly susceptible.

Results and Discussions

Screening chilli germplasm for anthracnose disease resistance in the field under natural conditions (Table 1):

The results obtained by screening the chilli genotypes for resistance against anthracnose disease in the field under natural conditions are presented in Table 1. The per cent disease index values ranged between 3.48 and 52.29. In the field, among the 30 genotypes screened against anthracnose, none were found to be immune. Three single plant selections namely AVPP0514, AVPP9813 and PBC-81 made in advanced generations of a genotype, were found to be resistant with the PDI of 4.2, 4.3 and 4.4 respectively, scoring grade 1. One line was found to be moderately resistant, scoring grade 2. In order of merit, the one moderately resistant line was EC-334182. Twenty-four scored the highest grade 3, only two lines scored the highest grade 4, thereby found to be highly susceptible (Devanur Deluxe - 57.5 and Bydagi-64.2) have also been noticed by Ruth beulah *et al*. (2007), Rahman *et al*. (2011), Salma Begum *et al*. (2015).

Screening chilli germplasm for resistance against anthracnose disease in under artificial conditions (Table 2):

Observation on disease severity was recorded at the maturity stage i.e. at 145 days after transplanting. All the genotypes reacted differentially significantly to anthracnose procured from different sources were screened in the field under artificial epiphytotic conditions during 2016 at college of horticulture, Rajendranagar, chilli seedlings were transplanted in a Randomized Block Design (RBD).

Table 1. Reaction of chilli genotypes to anthracnose disease in the field (under natural condition)

S. No.	Accession name	Fruit rot PDI	Grade	Reaction
1	EC-399569	44.3	3	S
2	EC-390033	37.6	3	S
3	IC-255916	42.0	3	S
4	EC-399535	35.6	3	S
5	EC-391083	42.5	3	S
6	IC-255944	43.8	3	S
7	IC-208591	41.4	3	S
8	IC-255958	44.9	3	S
9	IC-25913	38.3	3	S
10	EC-391088	40.5	3	S
11	IC-214966	45.1	3	S
12	IC-208534	35.3	3	S
13	EC-399572	39.5	3	S
14	AAT-22	33.4	3	S
15	SR-3429	31.4	3	S
16	NIC-19967	37.8	3	S
17	PSR-7074	36.7	3	S
18	LCA-625	39.6	3	S
19	LCA-999	45.2	3	S
20	LCA-620	45.0	3	S
21	Bydagi	64.2	4	HS
22	Devanur Deluxe	57.5	4	HS
23	Warangal Chapata	46.7	3	S
24	PBC-81	4.4	1	R
25	AVPP0514	4.2	1	R
26	AVPP9813	4.3	1	R
27	EC-334182	22.8	2	MR
28	EC-382175	47.8	3	S
29	IC-214965	42.9	3	S
30	EC-399533	36.2	3	S
	Grand mean	37.6936		
	SEd	1.60453		
	CD(0.05)	3.19782		
	CD (0.01)	4.28823		
	CV (%)	5.21346		

Significant at 5 per cent level Significant at 1 per cent level
HS- Highly susceptible S- Susceptible
MR- Moderately resistant R- Resistant

Table 2 indicates that the per cent diseases index values ranged between 22.7 to 86.8. All the 30 genotypes scored grades of 3 to 4 and were found to be three lines are moderately resistant AVPP0514, AVPP9813 and PBC-81. Six lines scored the highest grade 3, lines are susceptible. reaming 21 lines scored the highest grade 4 are highly susceptible have substantiated the findings of Ruth beulah *et al*. (2007), Rahman *et al*. (2011), Ajith and Manju (2015), Salma Begum *et al*. (2015).

Table 2. Reaction of chilli genotypes to anthracnose disease in the field (under artificial condition)

S. No.	Accession name	Fruit rot PDI	Grade	Reaction
1	EC-399569	69.3	4	HS
2	EC-390033	67.0	4	HS
3	IC-255916	75.5	4	HS
4	EC-399535	59.0	4	HS
5	EC-391083	46.9	3	S
6	IC-255944	75.0	4	HS
7	IC-208591	78.5	4	HS
8	IC-255958	82.4	4	HS
9	IC-25913	71.7	4	HS
10	EC-391088	74.6	4	HS
11	IC-214966	85.1	4	HS
12	IC-208534	79.2	4	HS
13	EC-399572	86.0	4	HS
14	AAT-22	46.9	3	S
15	SR-3429	44.6	3	S
16	NIC-19967	41.8	3	S
17	PSR-7074	46.3	3	S
18	LCA-625	85.5	4	HS
19	LCA-999	86.3	4	HS
20	LCA-620	86.8	4	HS
21	Bydagi	74.4	4	HS
22	Devanur Deluxe	74.0	4	HS
23	Warangal Chapata	60.6	4	HS
24	PBC-81	23.5	2	MR
25	AVPP0514	22.7	2	MR
26	AVPP9813	22.9	2	MR
27	EC-334182	47.0	3	S
28	EC-382175	74.0	4	HS
29	IC-214965	72.3	4	HS
30	EC-399533	80.9	4	HS
	Grand mean	64.6911		
	SEd	2.76861		
	CD (0.05)	5.51784		
	CD (0.01)	7.39934		
	CV (%)	5.24159		

Significant at 5 per cent level Significant at 1 per cent level
HS- Highly susceptible S- Susceptible
MR- Moderately resistant R- Resistant

Conclusion

Our experimental findings indicate that three lines are resistant AVPP0514, AVPP9813 and PBC-81, in the case of artificial condition three lines are moderately resistant AVPP0514, AVPP9813 and PBC-81 can be considered as a basis for resistance in breeding resistant germplasms or perhaps used as markers in MAS breeding of chilli genotypes. However, these results are needed to be strengthened by increasing the number of hybrids to be tested. Hence screening against multiple species is also suggested in breeding studies for resistance.

Acknowledgement

I would like to express my deepest appreciation and heartful thanks to the NBPGR & AVRDC, Hyderabad making the material available that is used in the present study. This endeavour would not have been possible without SKLTSHU for providing me with facilities and opportunities during these years.

Conflict of Interest: Nil

References

Ajith, P. M. and Manju, P. 2015. Genetic Parameters and Character Association for Yield and Anthracnose Resistance in Chilli (*Capsicum annuum* L.). *International Journal of Agriculture Innovations and Research.* 4 (1): 2319-1473.

Hazra, P., Chattopadhyay, A., Karmakar K. and Dutta. 2011. *Modern Technology in Vegetable Production,* New India Publishing Agency, New Delhi, India. p. 478.

Kim, W.G., Cho, E. G. Lee. and E. J. 1986. Two strains of *Colletotrichum gloeosporioides* Prnz. causing anthracnose of pepper fruits. *Kor. J. Plant Pathol*. 2: 107-113.

Purseglove, J.W. 1977. Tropical crops- Dicotyledons, Vol. 1, 2, *ELBS*, Longman, London.

Rahman, M.S., Akhter, M.S., Maya, M.A., Rahman, A. H. and Akanda, A. M. 2011. Field resistance of chilli cultivars against anthracnose disease caused by *Colletotrichum capsici*. *Thai Journal of Agricultural Science*. 44 (4): 243-250.

Ruth Beulah, R.A., Veera ragavathatham, D. and Prakasam, V. 2007. Screening of chilli germplasm for anthracnose resistance. *Madras Agric. J.* 94 (1-6): 14-22.

Salma Begum., Munmun N., Yumlembam R. and, P. S. Nath. 2015. Screening of chilli genotypes against anthracnose under field condition. *Environment & Ecology*. 33 (4): 1858-1862.

Wheeler, B.E.J. 1969. *An Introduction to Plant Diseases,* John Wiley and Sons Ltd., London, pp.301.