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EVALUATION OF RESISTANCE AGAINST ANTHRACNOSE (*COLLETOTRICHUM TRUNCATUM*) IN POPULAR HYBRIDS/VARIETIES CULTIVATED IN MAJOR CHILLI GROWING AREAS OF TELANGANA, INDIA

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ABSTRACT

Twenty popular hybrids/varieties cultivated in major chilli growing areas of Telangana were screened against Anthracnose caused by *Colletotrichum truncatum* under field conditions during *Kharif*, 2023 and *Kharif*, 2024. Ten hybrids *viz*., Blaze, Red rise (HPH), Krishna (BSS 604), Kalash (BSS 919), Yashaswini, Wonder hot, US-341, SVHA 2222, Kruthika and Jindal were found moderately resistant. Seven hybrids *viz.*, Soundarya - 117, Megahot, Shark-1, Priya 999, Hasini -99, Chapata (Single patti), and JINI- 2626 were found moderately susceptible, one variety *viz*., LCA 334 was found Susceptible and one variety *viz*., Chapata (Double patti) including susceptible check Arka lohit were found highly susceptible to anthracnose disease of chilli. These identified moderately resistant hybrids can be grown by the farmers to reduce the application of fungicide which in turn reduce the health hazards of the farmers and environment pollution.

Key words : Chilli, Screening, Anthracnose, Popular hybrids/varieties.

Introduction

Chilli (*Capsicum annum*) is considered as one of the commercial spice crops. It is the most widely used universal spice, named as wonder spice. Different varieties are cultivated for various uses like vegetable, pickles, spice and condiments. *Capsicum* having approximately 193 species, five of which are domesticated: *C. baccatum*, *C. annuum*, *C. frutescens*, *C. chinense* and *C. pubescens* and are cultivated in various parts of the world. Among the five species of *Capsicum*, *C. annuum* is one of the major cultivated crop worldwide (Tong and Bosland, 1999) followed by *C. frutescens* (Bosland and Votava, 2003). India is the world's largest producer, consumer and exporter of chillies. India is the world leader in chilli production followed by China, Thailand, Ethiopia and Indonesia. In India, major chilli producing states are Andhra Pradesh, Telangana, Madhya Pradesh, Karnataka and West Bengal.

In 2024-25, Telangana ranked third in chilli area and second in chilli production and productivity *i.e.*, 3.80 lakh acres, 6.89 lakh tonnes and 1813 Kg per acre, respectively. Chilli area and production in Telangana account for 17% and 26% of all India area and production, respectively. The major chilli growing districts are Khammam, Mahabubabad, Gadwal, Suryapet and Warangal (Rural) (Spice board of India). Different species of *Colletotrichum* namely *C. capsici*, *C. gloeosporioides*, *C. acutatum*, *Alternaria alternata*, *Fusarium sporotrichioides* and *F. oxysporum* are known to cause anthracnose/fruit rot in chilli; which also cause seed and seedling rot (Mesta,1996).

Among these, *C. capsici* is causing major damage at the ripening stage of the plant (Ranathunge *et al*., 2012;

Saxena *et al*., 2014) while, *C. gloeosporioides* have been found to be more abundant in developing infections of young and mature green fruits (Hong and Hwang, 1998; Kim *et al*., 1999) and *C. truncatum* alone caused 50% yield loss world wide (Pakdeevaraporn *et al*., 2005; Than *et al*., 2008).

Hence, the present investigation was done to find out the reaction of major hybrids/varieties grown by farmers against anthracnose of chilli. Management of the anthracnose disease requires frequent application of fungicide that has negative effect on farmers health, income and environment (Vorrips *et al*., 2004). Therefore, popular hybrids/varieties cultivated in major chilli growing areas of Telangana were screened for resistance to anthracnose where these potential sources of resistance can be utilized as resistant cultivars by farmers for sustainable disease management in chilli cultivation.

Materials and Methods

Twenty popular hybrids/varieties were screened against anthracnose of chilli during *Kharif*, 2023 and *Kharif*, 2024. The details of the hybrids screened against chilli anthracnose were given in Table 1.

Screening of chilli hybrids/ varieties against chilli anthracnose under field conditions

The six weeks old seedlings were transplanted in the experimental field (Block number: C; Plot number: 15) at Regional Agricultural Research Station (RARS), Warangal. The hybrids/ varieties were transplanted in randomized block design and replicated thrice with 10 plants per replication during *Kharif*, 2023 and *Kharif*, 2024. Border crop sorghum was sown around the plot, installation of solar lamp and blue, white & yellow sticky traps @ 10 were installed in the field for the control of insect pest as a measure of integrated pest management. All the agronomic practices like irrigation, fertilizer application, weedicide application / manual weeding were done as per the recommendations.

Inoculum preparation

The pure cultures obtained by single spore isolation were used for pathogenicity test under filed conditions. Conidial suspension was prepared from sporulated culture. About 5 ml of sterile distilled water was added to each plate and the conidia were loosened by gentle scraping with the help of a camel hair brush. Washing was repeated to get maximum spores into the suspension. The spore suspension was filtered through three layers of cheese cloth. Tween 20 (Polyoxyethylene sorbitol monoleate), a surfactant was added @ 0.1 per cent to the suspension that enable uniform spread of inoculum on the plants. Conidial suspension of *Colletotrichum truncatum* with 5×10^5 spore concentration was evenly sprayed using an atomizer on 70 day old chilli plants bearing green and red fruits. Un-inoculated plants (three) of each hybrids/ varieties were kept as control/check. Disease incidence was recorded 9 days after inoculation as per 0-9 disease rating scale (Kamble *et al*., 2015). Per cent disease index (PDI) was computed by using formula given by Wheeler (1969). On the basis of PDI values, genotypes were categorized in six disease reactions (Garg *et al*., 2014).

Symptomless (SL)	0
Resistant (R)	0.1-10
Moderately resistant (MR)	10.1-25
Moderately Susceptible (MS)	25.1-50
Susceptible (S)	50.1-75
Highly Susceptible (HS)	75.1-100

Table 1 : Details of the popular hybrids/varieties screened against anthracnose of chilli (*Colletotrichum truncatum*).

S. no.	Hybrid/variety name	Company
1	Yashaswini	Mahyco
2	Shark- 1	Star field
3	SVHA 2222	Seminis Bayer
4	Wonder hot	Seminis Bayer
5	Red rise (HPH – 5380)	Syngenta
6	Kalash (BSS 919)	Kalash seeds Pvt. Ltd.
7	Krishna (BSS 604)	Kalash seeds Pvt. Ltd.
8	US 341	BASF
9	Hasini- 99	Star field crop science
10	JINI 2626	Star field crop science
11	Soundarya 117	Kalash
12	Kruthika	Priya hybrid seeds
13	Priya 999	Priya hybrid seeds
14	Blaze	Banyan Agri Trend solutions Pvt. Ltd.
15	Jindal	Jindal seeds
16	Megahot 0825	Seminis Bayer
17	Chapata (Double patti)	Warangal local variety
18	Chapata (Single patti)	Warangal local variety
19	LCA 334	Variety developed by Horticulture Research Station, Lam Guntur
20	Arka lohit (SC)	Variety from Indian Institute of Horticultural Research, Bangalore

Statistical analysis

Field screening was done by conducting an experiment in randomized block design for two cropping seasons. The obtained data were subjected to a one-way analysis of variance (ANOVA). The comparative analysis of each chilli germplasm was done at 0.05 and 0.01 per cent level of significance using OPSTAT online Agriculture Data Analysis software (Sheoran *et al*., 1998).

Results and Discussion

Twenty popular hybrids/varieties including susceptible check were screened during *kharif*, 2023 and *kharif*, 2024 at Regional Agricultural Research Station (RARS), Warangal.

Screening of chilli hybrids/ varieties against chilli anthracnose under field conditions

During *kharif*, 2023-24, the results showed that Percent disease index ranged from 1.23 to 80.60 among the twenty popular hybrids/varieties screened against anthracnose of chilli (*Colletotrichum truncatum*). The minimum incidence was recorded on Hybrid Blaze with 1.23 PDI. None of the hybrid/ variety was found symptomless *i.e.*, highly resistant.

Ten hybrids *viz.*, Blaze (1.23 PDI), Kruthika (1.73 PDI), SVHA 2222 (2.03 PDI), Yashaswini (2.27 PDI), Hasini-99 (2.27 PDI), Jindal (5.80 PDI), Kalash (BSS 919) (6.77 PDI), JINI- 2626 (7.80 PDI), Priya 999 (8.10 PDI) and Shark-1(8.60 PDI) were found resistant, Six hybrids *viz.*, Wonder hot (10.77 PDI), Soundarya -117 (10.77 PDI), Krishna (BSS 604) (16.27 PDI), US-341 (18.23 PDI), Megahot (19.13 PDI) and Red rise (HPH) (19.60 PDI) were found moderately resistant, one variety Chapata (Single patti) (25.00 PDI) was found moderately susceptible, one variety *viz.*, LCA 334 (50.30 PDI) was found Susceptible and one variety *viz.*, Chapata (Double patti) (80.41 PDI) including susceptible check (SC) Arka lohit (80.60 PDI) were found highly susceptible to anthracnose disease of chilli (Tables 2 and 3).

During *kharif*, 2024-25, the results showed that Percent disease index ranged from 10.03 to 83.18 among the twenty popular hybrids/varieties screened against anthracnose of chilli (*Colletotrichum truncatum*). The minimum incidence was recorded on Hybrid Blaze with

Table 2 : Field screening of chilli hybrids/varieties against fruit rot (*Colletotrichum truncatum*) disease at RARS, Warangal.

S. no.	Hybrid/Variety	*Kharif*, 2023-24		*Kharif*, 2024-25	
		PDI at 79 DAT	Disease reaction	PDI at 79 DAT	Disease reaction
1	Yashaswini	2.27 (8.65)	R	14.10 (21.99)	MR
2	Shark-1	8.60 (17.03)	R	29.43 (32.81)	MS
3	SVHA 2222	2.03 (8.10)	R	17.60 (24.78)	MR
4	Wonder hot	10.77 (19.14)	MR	14.47 (22.34)	MR
5	Red rise (HPH)	19.60 (26.26)	MR	10.40 (18.79)	MR
6	Kalash (BSS 919)	6.77 (15.05)	R	13.01 (21.11)	MR
7	Krishna (BSS 604)	16.27 (23.77)	MR	12.20 (20.42)	MR
8	US-341	18.23 (25.25)	MR	17.55 (24.73)	MR
9	Hasini -99	2.27 (8.65)	R	38.64 (38.41)	MS
10	JINI- 2626	7.80 (16.21)	R	47.58 (43.59)	MS
11	Soundarya -117	10.77 (19.14)	MR	27.77 (31.77)	MS
12	Kruthika	1.73 (7.54)	R	17.90 (24.99)	MR
13	Priya 999	8.10 (16.52)	R	32.93 (35.00)	MS
14	Blaze	1.23 (6.36)	R	10.03 (18.45)	MR
15	Jindal	5.80 (13.89)	R	22.71 (28.43)	MR
16	Megahot	19.13 (25.92)	MR	29.04 (32.58)	MS
17	Chapata (Double patti)	80.41 (63.73)	HS	80.51 (63.80)	HS
18	Chapata (Single patti)	25.00 (29.95)	MS	44.93 (42.07)	MS
19	LCA 334	50.30 (45.15)	S	56.30 (48.60)	S
20	Arka lohit (SC)	80.60 (63.84)	HS	83.18 (65.78)	HS
	C.D.	1.797	-	2.433	-
	SE(m)	0.625	-	0.847	-
	SE(d)	0.884	-	1.197	-
	C.V.	4.707	-	4.441	-

Table 3 : Disease reaction of hybrids/varieties of chilli against fruit rot (*Colletotrichum truncatum*) disease at RARS, Warangal.

Percent disease index	Disease Reaction	*Kharif*, 2023-24		*Kharif*, 2024-25	
		Hybrids/varieties	No. of Hybrids/ varieties	Hybrids/varieties	No. of Hybrids/ varieties
0	Symptomless (SL)	-	-	0	0
0.1-10	Resistant (R)	Yashaswini, Shark-1 SVHA 2222, Kalash (BSS 919), Hasini -99, JINI- 2626, Kruthika, Priya 999, Blaze, Jindal	10	0	0
10.1-25	Moderately Resistant (MR)	Wonder hot, Red rise (HPH), Krishna (BSS 604), US-341, Soundarya -117, Megahot	6	Yashaswini, SVHA 2222 Wonder hot, Red rise (HPH), Kalash (BSS 919), Krishna (BSS 604), US-341, Kruthika, Blaze, Jindal	10
25.1-50	Moderately Susceptible (MS)	Chapata (Single patti)	1	Shark-1, Hasini -99, JINI- 2626, Soundarya -117, Priya 999, Megahot, Chapata (Single patti)	7
50.1-75	Susceptible (S)	LCA 334	1	LCA 334	1
75.1-100	Highly Susceptible (HS)	Arka lohit and Chapata (Double patti)	2	Arka lohit , Chapata (Double patti)	2

Fig. 1 : Incidence of fruit rot on Susceptible varieties: Chapata, LCA -334 and Arka lohit.

10.03 PDI. None of the hybrid/ variety was found symptomless *i.e.,* highly resistant as well as resistant.

Ten hybrids *viz*., Blaze (10.03 PDI), Red rise (HPH) (10.40 PDI), Krishna (BSS 604) (12.20 PDI), Kalash (BSS 919) (13.01 PDI), Yashaswini (14.10 PDI), Wonder hot (14.47 PDI), US-341 (17.55 PDI), SVHA 2222 (17.60 PDI), Kruthika (17.90 PDI) and Jindal (22.71 PDI) were found moderately resistant.

Seven hybrids *viz*., Soundarya -117 (27.77 PDI), Megahot (29.04 PDI), Shark-1(29.43 PDI), Priya 999 (32.93 PDI), Hasini-99 (38.64 PDI), Chapata (Single patti) (44.93 PDI) and JINI- 2626 (47.58 PDI) were found moderately susceptible, one variety *viz*., LCA 334 (56.30 PDI) was found Susceptible and one variety *viz*., Chapata (Double patti) (80.51 PDI) including susceptible check Arka lohit (83.18 PDI) were found highly susceptible to anthracnose disease of chilli (Tables 2 and 3).

The percent disease index on all the screened hybrids/ varieties increased in the *kharif*, 2024 when compared to the *kharif*, 2023. The reason, there was natural incidence of anthracnose disease in *kharif*, 2024 due to sowing of chilli crop on the same plot where *kharif*, 2023 trial was executed and incorporation of fruit rot samples in the field collected from different chilli growing areas of Telangana during survey, frequent irrigations (weekly once), which increased the micro climate humidity which favoured the development and spread of disease during the second season of crop *i.e., Kharif*, 2024 (Table 3).

It was evident from the results of various workers who evaluated different chilli germplasm lines against fruit rot pathogen. Angadi *et al.* (2003) screened 37 genotypes against *C. gloeosporioides* where none of the genotypes were found immune and six genotypes were found resistant. Patil *et al.* (2004) evaluated different cultivars against fruit rot caused by *Colletotrichum capsici* where none of the cultivars were found to be immune to the fruit rot under Vidarbha conditions. Parey *et al.* (2013) evaluated genotypes/ varieties against *C. capsici*, which revealed that none were resistant, however, DC-4, LCA-235, LCA-333, LCA-301 exhibited moderately resistant reaction under both field and pot culture conditions and minimum lesion size was also observed under detached method in these

genotypes. Mishra *et al*. (2019) screened 49 chilli genotypes for anthracnose resistance under both *in-vitro* and field conditions against *Colletotrichum truncatum* and *Colletotrichum gloeosporioides* where six were found resistant (Acchar lanka, CA-4, Pant C-1, Punjab Lal, Bhut Jolokia and BS-35). Vyshnavi *et al.* (2022) screened 22 chilli genotypes for anthracnose resistance under both *in-vitro* and field conditions against the pathogen where all the genotypes reacted differently and significantly to the pathogen and none of the genotypes were found completely resistant to anthracnose.

Conclusion

The present investigation concludes that none of the popular hybrids/varieties which were grown by farmers in major chilli growing areas of Telangana like Warangal, Khammam and Mahabubabad were found completely resistant to anthracnose of chilli caused by *Colletotrichum truncatum*. Out of sixteen hybrids screened, only ten hybrids *viz.*, Blaze, Red rise (HPH), Krishna (BSS 604), Kalash (BSS 919), Yashaswini, Wonder hot, US-341, SVHA 2222, Kruthika and Jindal were found moderately resistant. Seven hybrids *viz.*, Soundarya-117, Megahot, Shark-1, Priya 999, Hasini - 99, Chapata (Single patti) and JINI-2626 were found moderately susceptible, one variety *viz*., LCA 334 was found Susceptible and one variety *viz*., Chapata (Double patti) including susceptible check Arka lohit were found highly susceptible. These identified moderately resistant hybrids can be grown by the farmers to reduce the application of fungicide which in turn can reduce the health hazards of the farmers and also environment pollution.

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