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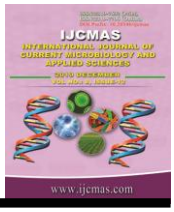

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Sources of Resistance for Charcoal Rot of Sorghum Caused by *Macrophomina phaseolina* (Tassi) Goid.

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A B S T R A C T

Seventy-eight genotypes were screened for charcoal rot resistance in the sick plot during *rabi* 2018-19. The results of the study indicated that the genotypes E 36-1 (11.53 %), followed by DSV 4 (12.24 %), Dagadi Solapur (13.40 %) showed less disease incidence compared to other genotypes. Highest per cent charcoal rot incidence was recorded in CSV 8R (54.34 %). The study also revealed that the local genotypes recorded reduced levels of other charcoal rot parameters such as per cent lodging due to charcoal rot (soft stalk), mean length of spread (MLS) and mean number of nodes crossed (MNC). The local genotypes also possessed desired breeding traits such as delayed senescence and stay green type which could be employed in resistance breeding programme of *rabi* sorghum.

Introduction

Sorghum [*Sorghum bicolor* (Linn.) Moench] has occupied an area of 56 lakh hectares with the production of 46 lakh tons and productivity of 812 kg/ha. Themajor sorghum cultivating states are Maharashtra, Karnataka, Rajasthan, Tamil Nadu and Andhra Pradesh. It is being grown in two seasons: *kharif* season as a rainfed crop while in *rabi* season under remaining soil moisture conditions. In Karnataka, it is cultivated on 10.90 lakh hectares of which 1.16 lakh hectares in *kharif* and 9.74 lakh hectares in *rabi* with production and productivity of 11.50 lakh tons and 1,052 kg ha^{-1}respectively (Anon., 2017).

Charcoal rot caused by *Macrophomina phaseolina* (Tassi) Goid. is major disease among biotic stresses in post rainy season and it cause major losses in grain and fodder yield. In India, almost all the cultivated hybrids and varieties are susceptible to charcoal rot (Jahagirdar, 2007). The indirect loss computed

due to this disease alone amounts to 40 per cent (Hiremath and Palakshappa, 1994). Patil (1980) reported that loss in grain yield was more in *rabi* (40.83 %) than in *kharif* (17.69 %).With this background, present investigation was made to screen seventy-eight genotypes for charcoal rot resistance.

Materials and Methods

Afield experiment was conducted at Main Agricultural Research Station, Dharwad in sick plot conditions during *rabi* 2018-19. Test genotypes were sown during the second fortnight of October with a spacing of 45cm×15cm with three replications. The susceptible check, CSV8R was sown after two test entries. Observations on charcoal rot incidence, mean length of spread (cm), mean number of nodes crossed and charcoal rot index (CRI) were recorded for screening purpose. Charcoal rot percentage and mean length of spread of lesion were used for estimation of charcoal rot index (CRI) using the formula (CRI = CRP × 0.4 + MLS × 0.6).Disease reaction of each genotype was determined following the CRI scales (Das *et al*., 2018).

CRI VALUE	Disease Reaction
≤ 5	Highly Resistant
6 – 10	Resistant
11 – 25	Moderately resistant
26 – 40	Susceptible
>40	Highly susceptible

Results and Discussion

The results revealed that, per cent charcoal rot was least in E 36-1 (11.53 %) followed by DSV 4 (12.24 %) and Dagadi Solapur (13.40 %). Highest per cent charcoal rot incidence recorded in CSV 8R(54.34 %). Least mean number of nodes crossed was recorded in E 36-1 (1.50), Kadumcuky (1.50) followed by DSV 4 (1.60) and Solapur Dagadi (1.60). Highest mean nodes crossed was recorded in CSV 8R (3.00). The least mean length of spread was noticed in E 36-1 (7.70 cm) followed by DSV 4 (12.33 cm). The highest mean length of infection was recorded in CSV 8R (35.40 cm). In case of charcoal rot index (CRI), the lowest CRI was recorded in E 36-1 (9.23) followed by DSV 4 (12.30) and Dagadi Solapur (16.61). The highest CRI value was recorded in CSV 8R (43.00) (Table 1).

Out of seventy-eight genotypes screened against charcoal rot incidence in sick plot, none of the genotype showed highly resistant reaction, only one genotype *i.e*., E 36-1 showed resistant reaction. Nineteen genotypes showed moderately resistant reaction. Fifty-seven genotypes showed susceptible disease reaction. One genotype *i.e*., CSV 8R showed highly susceptible reaction (Table 2).

The results of the screening were in accordance with studies made by Virupaksha Prabhu *et al*., (2012) who reported that the genotypes Dagadi Solapur (12.35 %) followed by GRS 1 (13.15 %) and BCR 9 (14.25 %) showed less charcoal rot incidence compared to other genotypes. CSV 8R genotype recorded higher disease incidence (56.10 %). Anahosur and Naik (1985) reported that susceptible genotypes possess less sugar content compared to resistant genotypes. Similarly, Nalawade *et al*., (2008) reported that resistant genotypes have more amount of sugar and phenolic compounds which confer resistant against the pathogen. In this present study, this may be the reason for genotypes showing resistant and susceptible disease reaction. Thus, from the results it is clear that employment of newer resistance sources particularly E 36-1 and Dagadi Solapur have shown resistance to charcoal rot over the years and can be effectively employed in resistance breeding programme against charcoal rot in sorghum.

Table.1 Field evaluation of sorghum genotypes against charcoal rot of sorghum

Sl. No.	Genotype name	Charcoal rot incidence (%)	Mean nodes crossed (No.)	Mean length of spread (cm)	Charcoal rot index
1.	KaradaMaldandi	38.88	2.25	26.60	31.80
2.	Kekri Local	24.24	2.00	28.00	26.50
3.	YermalDakuri	29.72	2.00	26.00	27.50
4.	E 36-1	11.53	1.50	07.70	09.23
5.	Pop Sorghum	38.23	2.40	25.00	30.30
6.	Tandalw	35.29	1.66	25.33	29.31
7.	IS 14338	46.42	2.00	27.50	35.07
8.	M 35-1	35.13	2.40	28.00	30.85
9.	Bulk Y	20.50	2.20	21.00	20.80
10.	IS 8283	37.83	2.00	28.75	32.38
11.	IS 3546	37.50	2.25	28.00	31.93
12.	SPV 1829	33.33	2.00	25.66	28.75
13.	Solapur M 35-1	32.50	2.50	28.25	29.95
14.	Phule Anuradha	28.12	2.00	28.50	28.34
15.	DSV 4	12.24	1.60	12.33	12.30
16.	CSV 8R	54.34	3.00	35.40	43.00
17.	CSV 22	35.89	2.00	27.50	30.85
18.	Parbhani Moti	36.36	2.00	25.33	29.74
19.	SPV 2217	22.22	2.00	23.50	23.00
20.	Phule Panchami	39.53	2.00	28.00	32.61
21.	IS 8607	33.33	2.20	29.00	29.35
22.	PVK Kranti	29.54	2.40	26.70	27.83
23.	Dagadi Solapur	13.04	1.60	19.00	16.61
24.	M 35-1 Akola	34.61	2.40	28.76	31.1
25.	Phule Vasudha	34.14	2.40	27.25	30.00
26.	JalnaDagdi	26.19	2.25	24.00	24.87
27.	SGMRN1-3-2	23.72	2.00	28.00	26.28
28.	Phule Maubee	27.27	2.40	26.25	26.65

Contd……

Sl. No.	Genotype name	Charcoal rot incidence (%)	Mean nodes crossed (No.)	Mean length of spread (cm)	Charcoal rot index
29.	Annigeri	25.53	2.00	22.33	23.61
30.	Muguti Dharwad	24.39	2.00	23.70	23.97
31.	Kadumcuky	36.00	1.50	23.00	28.20
32.	Phule Chitra	29.26	2.00	20.50	24.00
33.	Barsi Jowar	34.09	2.00	27.70	30.25
34.	BJV 44	19.56	1.67	20.70	20.24
35.	M 35-1-1	33.53	2.00	26.50	29.23
36.	M 35-1-2	36.53	2.00	27.80	31.30
37.	BarsiJoot	30.30	2.00	25.33	27.31
38.	Tandur Local	26.08	2.20	21.70	23.45
39.	Harini Jagadi	32.60	2.20	23.25	27.00
40.	E 24 Kdagdi	38.46	2.00	22.00	28.58
41.	Kddgn Local	25.58	2.00	27.20	26.55
42.	Biligunda	28.84	2.60	23.50	25.63
43.	Karjat Local	26.67	2.00	27.50	27.16
44.	Tassal	24.39	2.20	22.33	23.15
45.	Kadbina Jola	20.51	2.40	27.00	24.40
46.	Yarnal Local	39.47	2.20	22.70	29.40
47.	ChungiMaldandi	32.43	2.00	27.70	29.59
48.	Maldandi Local	34.21	2.00	28.70	30.90
49.	Yerimala Local	38.89	2.20	27.80	32.23
50.	TangriniganMaldandi 3	31.81	2.25	27.33	29.12
51.	SikkandarLakkadi	26.47	2.30	27.00	26.78
52.	Kodaimky	36.58	2.00	26.50	30.53
53.	DSV 5	25.58	2.40	21.75	23.28
54.	Phule Revati	24.39	2.40	27.00	25.95
55.	Chappalgaon Local	35.89	2.00	28.00	31.15
56.	Mssbr Local	32.65	2.00	26.33	28.85
57.	B 58586	27.27	2.00	21.00	23.50
58.	Hardakan Local	33.33	2.50	28.00	30.13

Contd……

Sl. No.	Genotype name	Charcoal rot incidence (%)	Mean nodes crossed (No.)	Mean length of spread (cm)	Charcoal rot index
59.	IS 14332	28.57	2.33	28.25	28.37
60.	IS 27042	22.50	2.25	28.00	25.80
61.	H 112	33.33	2.00	23.70	27.55
62.	IS 8757-2-3	20.83	2.25	28.00	25.13
63.	IS 8185	25.53	2.75	29.00	27.61
64.	IS 3547	40.00	2.40	25.70	31.42
65.	CSV 216R	25.00	2.60	27.50	26.50
66.	Maldandi Local	29.54	2.40	28.00	28.61
67.	SPV 1231	25.00	2.20	30.00	28.00
68.	SPV 475	32.00	2.20	27.33	29.19
69.	DSFR 5	28.94	2.00	26.33	27.37
70.	AKFS 3	29.03	2.00	28.70	28.83
71.	DMR 1	26.31	2.00	22.33	23.92
72.	DBR 1	32.50	2.00	26.70	29.02
73.	IS 2205	23.68	2.25	28.00	26.27
74.	IS 2312	29.41	2.00	28.25	28.71
75.	DMR 2	27.50	1.75	22.70	24.62
76.	IS 18551	36.80	2.25	28.25	31.67
77.	DSV 3	21.42	2.00	21.75	21.61
78.	DSFR 1	34.21	2.00	24.25	28.23

Table.2 Reaction of sorghum genotypes to charcoal rot

CRI value	Genotypes	Disease reaction
< 5	Nil	Highly resistant
5-10	E 36-1	Resistant
11-25	DSV 4, SPV 2217, Dagadi Solapur, JalnaDagdi, Annigeri, Muguti Dharwad, Phule Chitra, BJV 44, Tandur Local, Biligunda, Tassal, Kadbina Jola, DSV 5, B 58586, IS 8757-2-3, DMR 1, DMR 2, DSV 3, Bulk Y	Moderately resistant
26-40	KaradaMaldandi, Kekri Local, YermalDakuri, Pop Sorghum, Tandalw, IS 14338, M 35-1, IS 8283, IS 3546, SPV 1829, Solapur M 35-1, Phule Anuradha, CSV 22, Parbhani Moti, Phule Panchami, IS 8607, PVK Kranti, M 35-1 Akola, Phule Vasudha, SGMRN1-3-2, Phule Maubee, Kadumcuky, Barsi jowar, M 35-1-1, M 35-1-2, Barsijoot, Harini Jagadi, E 24 Kdagdi, Kddgn Local, Kajarat Local, Yarnal Local, ChungiMaldandi, Maldandi Local, Yerimala Local, TengriniganMaldnadi 3, Kodaimky, Phule Revati, Chappalgaon Local, Mssbr Local, Hardakan Local, IS 14332, IS 27042, H 112, IS 8185, IS 3547, CSV 216R, MaldandiLakkadi, SPV 1231, SPV 475, DSFR 5, AKFS 3, DMR 1, DBR 1, IS 2205, IS 2312, IS 18551, DSFR 1	Susceptible
> 40	CSV 8R	Highly susceptible

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