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Screening of Promising Sorghum Genotypes against Turcicum Leaf Blight (*Exserohilum turcicum* (Pass.) Leonard and Suggs) under Glasshouse Conditions

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A B S T R A C T

Sorghum (*Sorghum bicolor* Linn. Moench) popularly known as Jowar, is the major cereal consumed in India and ranks fifth after wheat, rice, maize and pearl millet. A total of 23 sorghum genotypes were screened for their reaction against turcicum leaf blight under glass house condition. Out of 23 genotypes screened, four showed resistant reaction (Grade-2) viz., J-P-1-5, J-9, IS-2312 and C-42. Whereas M 35-1, J-33, J-3-1, J-4-1, Chincholli, GS-23, E-36-1, J-35, C-35, J-9-12, J-6-2, J-11, C-30, J-8 and C-28 showed moderately resistant reaction (Grade-3) and remaining four genotypes viz., DSV-4, SPV-86, DJ-6514, H-112 recorded susceptible reaction (Grade-4).

Introduction

Sorghum (*Sorghum bicolor* Linn. Moench) popularly known as Jowar, is the major cereal consumed in India and ranks fifth after wheat, rice, maize and pearl millet. The world production of grain sorghum is 70.83 million tons from 44.8 million ha area of land (FAOSTAT, 2014). India is major producer of sorghum, ranks fifth after, wheat, rice, maize and pear millet cultivated in 6.16 million hectares in both *kharif* (2.26m.ha) and *rabi* (3.89m.ha) with an annual production of 5.44 million tons of grain with productivity of 8.44 kg per hectare (INDIASTAT, 2015).

In India the sorghum is cultivated in Maharashtra, Karnataka and Andhra Pradesh as rainfed crop to an extent of 85 per cent (4.93m.ha). In Karnataka sorghum production is about 1.32 million tons in an area of 1.04 million ha with the average productivity of 1180 kg per ha. The sorghum is the main food crop of Hyderabad-Karnataka region and occupies an area of 5.6 lakh hectares with production of 5.5 lakh tons and productivity of 1122kg per ha (Anon., 2014-15).

As the *rabi* sorghum produces the white pearly grains which is mainly used for food in India for the preparation of roti. It is also an important animal feed (swine, poultry and cattle) used in countries like U.S., Mexico, South America and Australia. Sorghum, as a food, feed and bio fuel crop with excellent drought resistance compared to other cereals, is considered as a “failsafe crop” (Burke *et al.,* 2010).

Sorghum grain is a principal source of energy, protein, vitamins and minerals for the poor people living in the semi-arid tropics. It is nutritionally superior to rice because of its high mineral and fiber content. Starch (60-75%) is the main component of sorghum grain, followed by proteins (7-15%), non-starch polysaccharides (2-7%) and fat (1.5-6%).The average energetic value of whole sorghum grain flour is 356 kcal/100gm (Dicko *et al.,* 2006). Sorghum is a good source of vitamins, notably the B vitamins (thiamin, riboflavin, pyridoxine and niacin) and the liposoluable vitamins A, D, E and K. Unique property of sorghum grain makes it well suited to prepare various food items such as porridge, unleavened bread, cookies, cakes, couscous and malted beverages, *etc*.

Even though the crop is robust and versatile, it has faced drawbacks in terms of yield and reduction in acreage due various diseases. The major diseases that affect sorghum include downy mildew, turcicum leaf blight, anthracnose and sorghum smuts (covered kernel smut, loose smut, long smut and head smuts). Turcicum leaf blight (TLB) is one of the most destructive foliar diseases of maize and sorghum. It can cause yield reduction more than 50 % in susceptible varieties and is favoured by mild temperatures and humid weather conditions with heavy dews (Bergquist, 1986). The disease occurs as long elliptic tan lesions that develop on lower leaves and progress upwards. Susceptibility to *Exserohilum turcicum* is reported to decrease with crop maturity (Frederiksen, 1980).

Most of the composites and hybrids which are being grown on commercial scale are found to be more or less susceptible to TLB. Host plant resistance is considered as most practical, feasible and economical method of plant disease management. Hence, screening of promising sorghum genotypes was undertaken under artificial inoculated conditions to identify source of resistance.

Materials and Methods

Nearly 23 promising sorghum genotypes were screened under glasshouse conditions by using Pot culture technique (Greenhouse screening technique).

Inoculum preparation

The fungal isolate was grown in potato dextrose broth in a rotary shaker (25°C, 125 rpm, with cool light) for 10 days. Conidia were separated from mycelial mat and medium by filtering the cultures through double-layered muslin cloth, and spore was adjusted to concentration (1×10^5 conidia mL^{-1}) with the help of haemocytometer. Two drops of Tween-20^{TM} was added to 100 ml inoculum just before inoculation.

Inoculation

Inoculum was sprayed on 21-days old plants raised in pots using a hand-held atomizer. The inoculated plants were air dried and transferred to a humid chamber for 24 h. Five plants/pot with 3 replications were maintained for each genotype. The plants were transferred to greenhouse benches and the pots were arranged in a complete randomized design and regular watering was provided to maintain high humidity. Data was recorded on latent period (time in days for the appearance of first chlorotic/necrotic lesion) starting the 4th day after inoculation on each genotype. Data was recorded for disease reaction types and disease severity on (1 to 5 scale) as described below (Thakur *et al.*, 2007) 14 days after inoculation.

Results and Discussion

A total of 23 sorghum genotypes were screened for their reaction against turcicum leaf blight under glass house condition.

Table.1 Disease severity (1-5 scale) against *E. turcicum* (Thakur *et al.*, 2007)

Severity Rating	Symptom and lesion types (on top four leaves)	Reaction type
1	No visible symptoms/chlorotic Flecks	Highly resistant (HR)
2	Up to 10% leaf area covered with small restricted lesions	Resistant (R)
3	11−25% leaf area covered with small restricted lesions	Moderately resistant (MR)
4	26−50% leaf area covered with large coalescing lesions	Susceptible (S)
5	>50% leaf area covered with large coalescing lesions	Highly susceptible (HS)

Table.2 Reaction of sorghum genotypes against *E. turcicum* under glasshouse conditions

SL.N0	Genotypes	Grade	Reaction
1	J-6-2	3	MR
2	J-4-1	3	MR
3	J-9-12	3	MR
4	J-9	2	R
5	J-35	3	MR
6	J-33	3	MR
7	C-38	3	MR
8	C-35	3	MR
9	C-42	2	R
10	C-28	3	MR
11	J-11	3	MR
12	J-8	3	MR
13	J-3-1	3	MR
	Checks		
14	GS-23	3	MR
15	Chincholli	3	MR
16	DSV-4	4	S
17	E-36-1	3	MR
18	J-P-1-5	2	R
19	DJ-6514	4	S
20	SPV-86	4	S
21	IS-2312 (Resistant Check)	2	R
22	H-112 (Susceptible check)	4	S
23	M 35-1	3	MR

R-Resistant, MR-Moderately resistant, S-Susceptible

The results reveals that, Out of 23 genotypes screened, four showed resistant reaction (Grade-2) *viz*., J-P-1-5, J-9, IS-2312 and C-42. Whereas M 35-1, J-33, J-3-1, J-4-1, Chincholli, GS-23, E-36-1, J-35, C-35, J-9-12, J-6-2, J-11, C-30, J-8 and C-28 showed moderately resistant reaction (Grade-3) and remaining four genotypes *viz.,* DSV-4, SPV-86, DJ-6514, H-112 recorded susceptible reaction (Grade-4) indicating their susceptibility for TLB under glasshouse condition (Table 1 and 2).

These are in agreement with results obtained by earlier workers (Vaibhav and Yogendra 2014) while working with turcicum leaf blight of sorghum who found 39 germplasms showed resistant reaction which included SPV 2019, SPV 2024, SPH 1653, SPV 2020 and SPV 2021; 43 showed moderately resistant reaction while 11 were recorded as susceptible. Moderately resistant germplasms included SPV 1822, SPV 2011, CSH 23, SPV 1871, SPV 2027 and SPV 2010.

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