

# IDENTIFICATION OF RESISTANT SOURCES IN GLASS HOUSE AND FIELD EVALUATION OF SOYBEAN GENOTYPES TO ANTHRACNOSE CAUSED BY *COLLETOTRICHUM TRUNCATUM* (SCHW.) ANDRUS AND MOORE

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## KEYWORDS

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## ABSTRACT

Among the nineteen soybean genotypes screened by artificial inoculation with *Colletotrichum truncatum*, four genotypes viz., DSb 12, DSb 20, DSb 23-5 and Kalitur were found highly resistant with a disease grade of one. The eight genotypes viz., DSb1, DSb 19, DSb 21, JS 95-60, JS 97-52, TGx 1835, EC 241780 and NRC 7 showed moderately resistant reaction with disease grade of 3. The two varieties Himso 1563 and JS 335 showed highly susceptible reaction with disease severity of 9 grades. In field screening of thirteen genotypes, DSb 12 and DSb 20 were found highly resistant to the disease with a grade of one. The five genotypes viz., DSb 1, DSb 19, DSb 21, JS 95-60 and JS 97-52 are fallen under the category of moderately resistant with a disease grade of 3. The genotype JS 335 was highly susceptible to anthracnose with a maximum disease grade of nine.

## INTRODUCTION

Soybean anthracnose has become one of the major threat in all soybean growing areas in recent years. In Karnataka, the disease has been noticed in severe form for the last two years owing to favourable weather conditions for growth and development of the pathogen at pod formation and pod development stage. The yield loss of 30 per cent has been recorded (Mahmood and Sinclair, 1992) due to *Colletotrichum truncatum*. Anthracnose is one of the major production constraints in all soybean growing areas of India. Sajeesh *et al.* (2014) also reported the study the seed to plant transmission of *R. bataticola*, *C. kikuchii*, *C. truncatum* and *Fusarium spp.*, revealed that apparently healthy and artificially inoculated seeds exhibited severe reduction in per cent germination and disease incidence was noticed after 20 DAS. Among the 42 cultivars screened of soybean and found none of the cultivars as either immune or highly resistant to the anthracnose disease. Twenty one cultivars showed susceptible reaction and 19 were found highly susceptible. One cultivar i.e. NRC-1 was found moderately resistant and cultivar Durga showed resistant reaction (Shirshikar, 1995). Out of 184 genotypes, none of the genotype found as immune or highly resistant to the disease. However, four genotypes viz., Kalitur, PKV-1, MAUS 13 and Birsra were resistant against anthracnose disease (Gawade *et al.*, 2009). A lot of work has been done on anthracnose but it remained scattered.

Therefore, it was reviewed on available information pertaining to taxonomy, ecology, biology, epidemiology, lifecycle, host pathogen interaction, resistant sources and also effective management strategies. The presently cultivated varieties in India are either susceptible or highly susceptible to anthracnose disease (Sharma *et al.*, 2011). In this context, the present investigations were undertaken to identify new sources of resistance against anthracnose disease and their further utilisation in contemporary resistance breeding programme.

## MATERIALS AND METHODS

### Glasshouse screening of genotypes for identifying resistant sources

Nineteen soybean genotypes obtained from All India Co-ordinated Research Project on Soybean (AICRP on Soybean), Main Agricultural Research Station, University of Agricultural Sciences, Dharwad were screened against *Colletotrichum truncatum* under glass house conditions. To carry out the screening work, 57 plastic pots (18×12cm) were taken with sterilized soil and kept in glass house. 10 seeds of each cultivar were sown in each pot and three such pots were maintained for each genotype. Later, five seedlings per pot were maintained for screening purpose. Spray of inoculum was done by grinding the mycelial mat having conidia of *C. truncatum* which was prepared from ten days old culture grown on potato dextrose broth medium and seedlings were inoculated with

grinded mycelial mat after 10 days of sowing, before flowering and at pod formation. After inoculation, the seedlings were covered with polythene cover for 48 hrs to create high humidity (Sajeesh *et al.*, 2014). Observations on symptom development were recorded on 4 days after inoculation. For recording observation, three leaves per plant in five seedlings from each pot were selected randomly and intensity was measured using zero to nine scale given by Mayee and Datar (1986). Per cent disease index was worked out by using the formula of Wheeler (1969). The resistance reaction of genotypes was categorised as detailed below.

#### Genotype categorization based on disease rating,

##### Field screening of genotypes

A field experiment was conducted to know the resistance levels

Category	Reactions	Description
0	Immune	No of lesions / discolouration
1	Resistant	1% area covered with lesions /spots/ discolouration
3	Moderately resistant	1.1-10% area covered with lesions /spots/dicolouration
5	Moderately susceptible	10.1-25% area covered with lesions /spots/dicolouration
7	Susceptible	25.1-50% area covered with lesions /spots/dicolouration
9	Highly susceptible	>50% area covered with lesions /spots/dicolouration

of the available genotypes which were developed at the All India Co-ordinated Research Project on Soybean (AICRP on Soybean), Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during Kharif 2012- 13. A total of 15 genotypes were evaluated. The experiment was conducted with randomized block design with three replications. The severity of anthracnose was recorded using a disease rating scale 0 to 9 given by Mayee and Datar (1986)

**Table 1: Glasshouse screening of genotypes against *Colletotrichum truncatum***

Sl.No.	Name of the genotype	Disease grade on leaves (0-9)	Disease reaction
1.	DSb 1	3	MR
2.	DSb 12	1	HR
3.	DSb 19	3	MR
4.	DSb 20	1	HR
5.	DSb 21	3	MR
6.	DSb 22	5	MS
7.	DSb 24	7	S
8.	JS 95-60	3	MR
9.	JS 97- 52	3	MR
10.	JS 93-05	7	S
11.	DSb 15	7	S
12.	Himso 1563	9	HS
13.	DSb 23- 5	1	HR
14.	Kalitur	1	HR
15.	TGx 1835	3	MR
16.	JS 335	9	HS
17.	EC 241778	7	S
18.	EC 241780	3	MR
19.	NRC 7	3	MR

Note: 0-AR, 1-HR, 3-MR, 5-MS, 7-S, 9-HS.

as described earlier.

## RESULTS AND DISCUSSION

### Glasshouse screening of genotypes against *Colletotrichum truncatum*

The nineteen soybean genotypes were screened by artificial inoculation with *Colletotrichum truncatum* to find out the sources of resistance. The results obtained are presented in Table 1, Plate 1. The results indicated that, among the nineteen genotypes screened, none of them are found immune. The four genotypes viz., DSb 12, DSb 20, DSb 23-5 and Kalitur were found highly resistant with a disease grade of one. The eight genotypes viz., DSb 1, DSb 19, DSb 21, JS 95-60, JS 97-52, TGx 1835, EC 241780 and NRC 7 are fallen under the category of moderately resistant with disease grade of three. The genotype DSb 22 has showed five grade the moderately susceptible reaction to the disease. Recorded the susceptible reaction in genotypes viz., DSb 24, JS 93-05, DSb 15 and EC 241778 with a disease grade of seven. The two genotypes Himso 1563 and JS 335 showed disease grade of nine were found highly susceptible to of *C. truncatum*. Sajeesh *et al.* (2014) reported that out of 11 entries screened against anthracnose/pod blight of soybean, 64 per cent genotypes were showed moderately resistant reaction. Genotype DSb 12 was showing the resistant reaction.

### Field screening of genotypes against *Colletotrichum truncatum*

To identify the sources of resistance, thirteen genotypes were screened against anthracnose under field conditions at MARS, Dharwad during *kharif* 2012 as explained in Material and Methods. The data on reaction of genotypes are presented in Table 2, Plate 2. During 2012, the genotypes viz., DSb 12 and DSb 20 were found highly resistant to the disease with a grade of one. The five genotypes viz., DSb 1, DSb 19, DSb 21, JS 95-60 and JS 97-52 are fallen under the category of moderately resistant with a disease grade of three. The genotype DSb 22 has showed a disease grade of five with moderately susceptible reaction to the disease. The susceptible reaction to the disease was recorded in four genotypes viz., JS 93-05, DSb 24, DSb 25 and DSb 15 has a grade of seven. The genotype JS 335 was highly susceptible to anthracnose showed a maximum disease

**Table 2: Field screening of genotype against *Colletotrichum truncatum***

Sl.No.	Name of the genotype	Disease grade on pods (0-9)	Disease reaction
1.	DSb 1	3	MR
2.	DSb 12	1	HR
3.	DSb 19	3	MR
4.	DSb 20	1	HR
5.	DSb 21	3	MR
6.	JS 93-05	7	S
7.	DSb 24	7	S
8.	DSb 25	7	S
9.	JS 95-60	3	MR
10.	JS 97- 52	3	MR
11.	DSb 15	7	S
12.	DSb 22	5	MS
13.	JS 335	9	HS

Note: 0-AR, 1-HR, 3-MR, 5-MS, 7-S, 9-HS.



View of pot culture



DSb 23-5



DSb 20



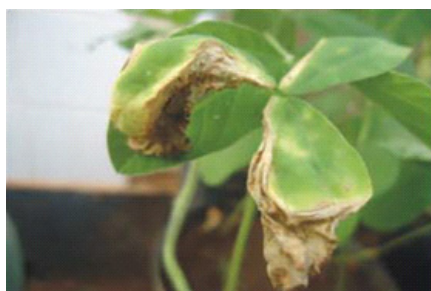
DSb 12



Kalitur



JS 335



Himso 1563

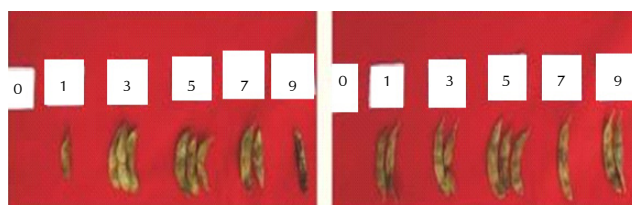


General view of the field

**Plate 1: Screening of genotypes under artificial condition against *Colletotrichum truncatum***

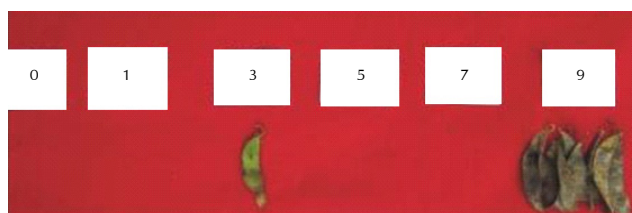
grade of nine.

In the present investigation, nineteen soybean genotypes were screened to find out the sources of resistance against *C. truncatum*. The studies indicated that the nineteen genotypes screened, none of them are found immune. The four genotypes viz., DSb 12, DSb 20, DSb 23-5 and Kalitur were found highly resistant. The eight genotypes viz., DSb 1, DSb 19, DSb 21, JS 95-60, JS 97-52, TGx 1835, EC 241780 and NRC 7 are found to be moderately resistant. The genotype DSb 22 has shown the moderately susceptible reaction to the disease. The susceptible reaction to the disease was recorded in four genotypes viz., DSb 24, JS 93-05, DSb 15 and EC 241778. The two genotypes Himso 1563 and JS 335 were found highly susceptible to attack of *C. truncatum*. The genotypic reactions previously also reported by Madhusudhan (2002) and Shirshikar (1995) against *C. truncatum* showed susceptible reaction of Himso 1563 and JS 335 of soybean. The management of disease through host plant resistance is important component in all the crop improvement programmes. Utilization of resistant cultivars in farming is the most simple, effective and economical method in the



DSb 12

DSb 20



JS 335

**Plate 2: Screening of genotypes under field condition**

management of diseases. Besides these, the resistant cultivars conserve natural resources and reduce the cost, time and energy when compared to other methods of disease management. In order to verify the resistance of these high yielding genotypes, thirteen genotypes were screened against anthracnose with 0 to 9 scale under field conditions. The genotypes viz., DSb 12 and DSb 20 were found highly resistant to the disease. The five genotypes viz., DSb 1, DSb 19, DSb 21, JS 95-60 and JS 97-52 are fallen under the category of moderately resistant. The genotype DSb 22 has shown the moderately susceptible reaction to the disease. The susceptible reaction to the disease was recorded in four genotypes viz., JS 93-05, DSb 24, DSb 25 and DSb 15. The genotype JS 335 was highly susceptible to anthracnose. These investigations were previously reported by Chacko and Khare (1978), Gawade *et al.* (2009). The genotypes DSb 12 and DSb 20 showed highly resistant reaction both in glasshouse and field condition. Among 15 genotypes tested, Mandarin, Mandarin 507, and Mandarin (Ottawa) had the greatest ( $P < 0.05$ ) level of resistance to *C. truncatum* causing soybean anthracnose compared to the other genotypes except for Early White Eyebrow that appeared to be as resistant as Mandarin (Ottawa) as reported by Yang and Hartman (2015).

However, the genotypes such as DSb 1, DSb 19, DSb 21, JS 95-60 and JS 97- 52 showed moderately resistance in both glasshouse and field condition. The genotype JS 335 showed highly susceptible reaction to anthracnose in glasshouse and field condition. The genotypes which showed highly resistant reaction such as DSb 12 and DSb 20 are further exploited for incorporation in to durable resistance breeding programme and also for general into cultivation.

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