The Journal of Phytopharmacology 2022; 11(1):32-34
Online at: www.phytopharmajournal.com

Research Article

ISSN 2320-480X
JPHYTO 2022; 11(1): 32-489
January- February
Received: 15-12-2021
Accepted: 04-02-2022

doi: 10.31254/phyto.2022.11106

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Screening of soybean genotypes for pod blight resistance under natural inoculum pressure

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ABSTRACT

Soybean, an important oilseed and legume crop, has risen in popularity in recent years owing to its value in terms of yield and nutrition. Pod Blight caused by *Colletotrichum truncatum* (Schwa). Andrus and Moore can cause heavy yield loss ranging from 16-100 percent. The present investigation was conducted at Botany Farm, Division of Botany, College of Agriculture, Pune during Kharif 2020 to screen soybean genotypes for pod blight resistance on the basis of percent pod infection (PPI) under field conditions. The experimental material consisted of 30 elite genotypes of soybean obtained from the Officer in charge, Agriculture Research Station (ARS), Kasbe Dig raj, Sangli. Most of the genotypes were found to be moderately resistant (6-25% PPI). None of the genotypes were found immune or resistant. The genotype showing least pod blight incidence was DSb-33.

Keywords: Moderately Resistant, Natural Inoculum Pressure, Percent Pod Infection (PPI), Pod Blight, Resistant, Soybean.

INTRODUCTION

Among grain legumes, soybean has the highest protein and oil content. It is a major source of vegetable oil in the world. In addition, it is short duration, drought resistant and has high yielding ability. Numerous plant pathogens have been reported to cause yield losses in soybean, but pod blight (anthracnose) caused by Colletotrichum truncatum (Schwa.) Andrus and Moore are one of the most important in terms of economic losses. This disease is especially prominent in the tropics having warm and humid climate. This disease was first reported in India by Verma and Upadhyay (1973) [1].

Symptoms of anthracnose appear at early reproductive stages on stem, pods and petiole as irregularly shaped brown lesions, but pod blight phase is the most damaging. Reddish brown spots appear on pods and later turn black. Fruiting bodies on infected pods resemble small pin cushions surrounded by minute blackish brown setae and infected pods finally get dried out prematurely with shriveled and moldy seeds. The disease causes considerable damage by reducing plant stand, seed quality, seed germination and yield and affected plants are significantly shorter with fewer pods and seeds with reduced seed weight. Pod blight of soybean is thus a major constraint in the production of soybean crop.

Sajeesh et al. (2014) screened 11 entries of soybean for pod blight resistance and found that 64% genotypes showed moderately resistant reaction [2]. Genotype Dbs. 12 showed resistant reaction. Chavan et al. (2018) found under artificial epiphytotic and controlled conditions, all the soybean entries studied exhibited different reactions against *C. truncatum* [3]. Most test entries were found moderately resistant. Many test entries were found susceptible and very few were found highly susceptible or moderately susceptible. None was found highly resistant or immune to the disease.

Natraj et al. (2020) evaluated 225 germplasms of soybean for anthracnose resistance which resulted in the identification of five genotypes viz., EC 538828, EC 34372, EC 457254, AKSS 67 and Karuna as highly resistant [4]. Study of genetics of anthracnose resistance revealed that the resistance was governed by two major genes interacting in complementary fashion. This was the first report on genetics of anthracnose resistance in soybean. Research findings from this study indicated the potential role of exotic germplasm in Indian soybean improvement against anthracnose disease.

MATERIALS AND METHODS

Thirty genotypes of soybean obtained from Agriculture Research Station (ARS), Kasbe Dig raj, Sangli were screened under field conditions at Botany Farm, Division of Botany, College of Agriculture, Pune. The genotypes were evaluated in a Randomised Block Design (RBD) with three replications during Kharif 2020, sown at a spacing of 30×10 cm in a single row of 3 m length. Five plants per genotype per replication was selected at random for recording number of pods exhibiting typical symptoms of pod blight 15 days before harvesting and averages were calculated. The plants were graded and categorized on the basis of percent pod infection calculated as:

$$\text{Percent pod infection (\%)} = \frac{\text{No. of infected pods}}{\text{Total No. of pods observed}} \times 100$$

When PPI (%) was 0 the genotype was characterised as Immune; when PPI < 1 genotype was characterised as Highly Resistant; when PPI 2-5 genotype was characterised as Resistant; when PPI 6-25 genotype was characterised as Moderately Resistant; when PPI 25-50 genotype was characterised as Susceptible and when PPI >75 genotype was characterised as Highly Susceptible.

RESULTS AND DISCUSSION

The mean percent pod infection of the various genotypes studied in listed in Table 1. DSb-33, KDS-344, AMS-20-19 genotypes of soybean showed the lowest mean pod blight incidence among the genotypes studied. The genotype showing least pod blight incidence was DSb-33.

Most of the genotypes were found to be moderately resistant (6-25% PPI). AMS-MB-5-19, HIMSO-1690, JS-335, KDS-992, KDS-1095, KDS-1149, NRC-142, RSC-11-22, RVS-2011-76 were found to be susceptible to pod blight (25-50% PPI). The rest of the genotypes i.e. AMS-20-19, AMS-353, AMS-100-39, DS-228, DSb-33, DSb-36, GBIC-18758, JS 93 05, KDS-344, KDS-726, KDS-753, KDS-980, KDS-1045, KDS-1096, KDS-1097, KDS-1144, KDS-1150, MAUS-732, MAUS-8060, NRC-168 and TS-46 were moderately resistant. None of the genotypes were found to be immune or resistant to pod blight [Table 2].

Similar results were obtained by Sajeesh et al. (2014) and Chavan et al. (2018) [2,3].

Table 1: Mean PPI (%) of thirty genotypes of soybean under natural inoculum pressure

Sr. No.	Genotype	Mean PPI	Sr. No.	Genotype	Mean PPI
1	AMS-20-19	7.34	16	KDS-992	32.10
2	AMS-353	15.39	17	KDS-1045	13.30
3	AMS-MB-5-19	32.33	18	KDS-1095	29.12
4	AMS-100-39	9.58	19	KDS-1096	14.33
5	DS-228	13.14	20	KDS-1097	15.88
6	DSb-33	6.70	21	KDS-1144	11.3
7	DSb-36	9.15	22	KDS-1149	31.17
8	GBIC-18758	12.72	23	KDS-1150	18.46
9	HIMSO-1690	28.03	24	MAUS-732	9.15
10	JS-335	39.29	25	MAUS-8060	14.72
11	JS-9305	9.39	26	NRC-142	28.56
12	KDS-344	7.22	27	NRC-168	13.65
13	KDS-726	14.65	28	RSC-11-22	30.40
14	KDS-753	10.31	29	RVS-2011-76	25.34
15	KDS-980	13.69	30	TS-46	10.78

Table 2: Reactions of soybean genotypes against pod blight under natural inoculum pressure

S. No	Reaction	PPI (%)	Name of genotypes
1	Immune	0	**NIL**
2	Highly Resistant	< 1	**NIL**
3	Resistant	2-5	**NIL**
4	Moderately Resistant	6-25	AMS-20-19, AMS-353, AMS-100-39, DS-228, DSb-33, DSb-36, GBIC-18758, JS 93 05, KDS-344, KDS-726, KDS-753, KDS-980, KDS-1045, KDS-1096, KDS-1097, KDS-1144, KDS-1150, MAUS-732, MAUS-8060, NRC-168, TS-46
5	Susceptible	25-50	AMS-MB-5-19, HIMSO-1690, JS-335, KDS-992, KDS-1095, KDS-1149, NRC-142, RSC-11-22, RVS-2011-76
6	Highly Susceptible	>75	**NIL**

CONCLUSION

According to mean values, DSb-33, KDS-344, AMS-20-19 showed the lowest pod blight incidence among the genotypes studied. Most genotypes were found to be moderately resistant to pod blight and none were found to be resistant or immune. The genotype showing least pod blight incidence was DSb-33.

Thus, soybean genotypes that were found moderately resistant against pod blight could further be exploited for breeding disease resistant varieties of soybean. They can also be encouraged for the commercial cultivation on a large scale. The genotypes found susceptible must not be cultivated in high-risk areas.

Conflict of Interest

None declared.

Financial Support

None declared.

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HOW TO CITE THIS ARTICLE

Barpanda T, Chavan BH, Deshmukh MP, Rajput HJ. Screening of soybean genotypes for pod blight resistance under natural inoculum pressure. J Phytopharmacol 2022; 11(1):32-34. doi: 10.31254/phyto.2022.11106