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Screening of Available Genotypes against Pod Blight Complex Disease of Soybean *Glycine max* (L.) Merill

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A B S T R A C T

Soybean has great potential as an exceptionally nutritive and very rich protein food, which is one of the five most important oil seed crops of the world. Over hundreds of pathogens are known to affect soybean, of which 66 fungi, six bacteria and eight viruses have reported to be associated with soybean seeds. In India, losses due to various diseases are estimated as 12% of total production. Host plant resistance is an economical as well as desirable component in the management of seed-borne as well as air-borne diseases. Since, pod blight complex disease is caused by *Colletotrichum truncatum* (Schew.) Andus and Moore, *Colletotrichum gloeosporoides* (Penz.) Penz. and Sac. and *Rhizoctonia bataticola* (Taub.) Butler is one of the emerging threat to soybean industry in recent years, identification of genotypes that can resist or tolerate the seed-borne/air-borne infections during later stages of crop growth are useful in minimizing yield loss due to the disease as well as reducing primary inoculum. The experiment on screening of available genotypes has taken under natural epiphytotic condition at MARS, Dharwad during kharif of 2016 and 2017. Out of 235 entries screened against pod blight disease complex of soybean in both the seasons of kharif 2016 and 2017, None of them were immune or absolutely resistant, 1 genotype i.e. MACS 1505 showed resistant reaction to pod blight, most of the entries like RKS 18, DSb 28-3, DSb 23-2 and DSb 30-2 were moderately resistant and SL 1104, DSb 32, RSC 10-70, KDS 921, NRC 125, RSC 10-71, DS 3106, RSC 10-52, JS 20-116 are moderately susceptible in reaction. Genotypes like JS 335, KDS 726 and KDS 780 were showed susceptible reaction and three genotypes JS 93-05, Punjab 1 and Bragg are highly susceptible to disease.

Introduction

Soybean *Glycine max* (L.) Merill is a native of eastern Asia popularly known as 'Chinese pea' or 'Manchurian bean.' Further it is also referred to as 'Golden bean' or 'Miracle bean' and wonder crop of the 20th century because of its characters and usage (Sinclair and Backman, 1989). It has great potential as an exceptionally nutritive and very rich protein food. It can supply the much needed protein to human diets, because it contains more than

forty per cent protein of superior quality and all the essential amino acids particularly glycine, tryptophan and lysine, similar to cow's milk and animal proteins. As soybean, acreage has increased throughout the world, so the pathogens attacking the crop have increased in number and severity (Gupta and Paul, 2002). Since soybean is highly protein rich (40%) and having good oil percentage (20%) these pathogens becoming major constraint in soybean production both in terms of yield, protein and oil percentage (Rathore, 2005).

The climatic conditions and seasonal differences in tropics vary mainly due to rainfall patterns which affect the distribution and importance of diseases. Yield losses for some diseases range from relatively minor to potentially devastating (Sinclair, 1993). The world loss of more than seven million tons of soybean is reported due to diseases alone (Sinclair, 1974). In India, losses due to various diseases are estimated as 12% of total production. It is cultivated over an area of 0.27 million hectare with a production of 0.17 million tonnes and productivity of about 639 kg/ha in Karnataka (Anonymous, 2017). The state productivity (639 kg/ha) and national productivity (803 kg/ha) are low in comparison with world average (2735 kg/ha). The major soybean growing states in the country are Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh, etc.

Among the fungal diseases infecting soybean crop, pod blight complex disease caused by *Colletotrichum truncatum, Colletotrichum gloeosporoides and Rhizoctonia bataticola* is one of the most important and destructive disease causing lower production and productivity and higher yield losses in soybean. For the management of these diseases best option is the use of host plant resistance. Even though there are other methods to combat the diseases such as cultural, physical, biological, chemical means, the host plant resistance is paramount because of its ecofriendly nature and cost effectiveness and one of the easiest and cheapest methods to manage the disease is to select the resistant genotypes against pod blight disease complex.

Materials and Methods

The experiment was undertaken during *kharif* 2016 and 2017 at MARS, Dharwad. The available sources of resistance were used for this study i.e. yield trial material, rust resistance germplasm lines and multiple disease resistance entries were screened to identify the source of resistance to pod blight disease complex under natural field epiphytotic conditions. The trials were conducted in RBD with plot size of 4 m X 1.4 m (each entry). All the package of practices was carried under unprotected conditions for diseases.

The severity of pod blight was recorded using a disease rating scale 0 to 9 given by Mayee and Datar (1986).

Per cent disease index/severity was calculated by using formula.

$$\text{Per cent Disease Index} = \frac{\text{Summation of numerical ratings}}{\text{No. of pods observed X Max. disease rating}} \text{ X100}$$

Results and Discussion

Two thirty five genotypes from different sources were screened for pod blight disease complex in soybean at MARS, Dharwad, during the year *kharif* 2016 and 2017 respectively under natural field ephiphytotic conditions. The results revealed that, out of 235 sources of resistance evaluated none of the entries showed absolute resistant in both the seasons one genotype i.e. MACS 1505 showed resistant reaction to pod blight disease in soybean (Table 1–3).

Table.1 Screening of available genotypes against pod blight disease complex of soybean during *kharif* 2016 at Dharwad

Sl. No	Grade	Reaction	No. of entries	Name of the entries
1	0	I	00	-
2	1	R	01	MACS 1505
3	3	MR	40	TS 80, JS 1-08, VLS 92, PS 1589, MACS 1543, DS 3105, MACS 1520, PS 1587, NSO 626, AMS-MB 5-18, KDS 980, PS 1569, JS 20-94, JS 20-98, RKS 18, DSb 28-3,DSb 23-2, DSb 30-2, EC 391336, EC 379152, EC 3251, EC 241780, EC 241778, EC 100027, EC 10332, EC 107407, EC 14458, EC 14476, EC 241656, EC 242086, EC 291398, EC 291448, EC 308287, EC 309509, EC 309537, EC 383165, M 204, MACS 58, P 1210178, P 1259539
4	5	MS	63	VLS 58, VLS 59, VLS 63, SL 688, JS 97-52, DSb 21, SL 525, PS 1347, SL 1104, KDS 1045, DSb 32, RVS 2009-9, NRC 126, RSC 10-70, KDS 921, Himso 1687, MAUS 711, AMS-MB 5-19, NRC 125, RSC 10-71, PS 1086, TS 70, VLS 93, NRC 127, SL 1113, DS 3106, BAU 100, RSC 10-52, NRC 124, JS 21-05, NRC 77, VLS 89, JS 20-116, NRC 117, RS 2010-1,PS 1572, SL 1074, RAUS 5, MACS 1460, RSC 10-46, KDS 753, KDS 869, RUS 2007-6, RUS 2008-24, JS 20-96,RUS 2008-4, RUS 2008-8, EC 242104, GP 268, AGR 166, AGS 2, AGS 95, B 254, EC 107416, EC 245988, EC 280149, EC 333879, EC 34057, EC 39177, EC 457286, EC 467282, EC 615160, EC 7048
5	7	S	14	JS 93-05, JS 335, DSb 31, JS 93-05, PS 1042, KDS 726, KDS 780, EC 241309, EC 241696, EC 242072, EC 309968, EC 325103, EC 325111, JS 335
6	9	HS	01	Bragg

Table.2 Screening of available genotypes against pod blight disease complex of soybean during *kharif* 2017 at Dharwad

Sl. No	Grade	Reaction	No. of entries	Name of the entries
1	0	I	00	-
2	1	R	00	-
3	3	MR	54	AMS 2014-1, AMS 100-39, CSB 10112, NRC 128, NRC 136, BAUS 102, VLS 95, AUKS 174, KDS 1095, RVS 2011-3, TS 53, RKS 18, MACS 1493, PS 1613, KDS 992, RSC 11-07, DSb 34, MAUS 725, MACSNRC 1575, MAUS 731, RVS 2011-2, PS 1611, NRC 129, RSC 11-03, SL 1068, JS 95-60, SL 958, PS 1092, SL 113,SKF 1050, Shalimar soybean, DSb 32, KDS1045, NRC 86, NRC 126, NRC 127, RUS 2009-9, SL 1104, JS 20-34, JS 95-60, SL 958, PS 1092, PS 1347, RSC 10-46, SL 1074, DSb 23-2, DSb 28-3, DSb 30-2, EC 391336, EC 379152, EC 3551, EC 241780, EC 241778, JS 20-08
4	5	MS	56	JS 21-15, JS 20-17, DS 3108, NRC 130, NRC 137, CSB 10084, Shivalik, NRC 37, NRC 132, NRC 133, NRC 131, NRCSL 1, NRC 134, RVS 2011-1, VLS 58, VLS 94, DSb 21, Pusa 97-12, SL 688, VLS 59, SKF-SPS-11, AMS MBS-18, DS 3105, DS 3106, MACS 1520, NRC 37, NRC 86, NRC 125, RSC 10-52, RSC 10-70, RSC 10-71, Shivalik, JS 20-94, JS 20-116, JS 75-46, JS 95-46, JS 72-44, JS 97-52, VLS 63, VLS 89, PS 1556, PS1572, RUS 2007-6, RUS 2010-1, SL 10-28, KDS 753, PS 1569, RUS 2002-4, RUS 2008-24, RUS 2008-8, EC 242104, GP 268, KDS 869, KDS 921, KDS 980, DSb 31
5	7	S	03	JS 335, KDS 726, KDS 780
6	9	HS	03	JS 93-05, Punjab 1, Bragg

Table.3 The genotypes showed similar reaction against pod blight disease complex of soybean during *kharif* 2016 and 2017at Dharwad

Sl. No	Grade	Reaction	No. of entries	Name of the entries
1	0	I	00	-
2	1	R	00	-
3	3	MR	04	RKS 18, DSb 28-3, DSb 23-2 and DSb 30-2
4	5	MS	24	VLS 58, VLS 59, VLS 63, VLS 89, SL 688, JS 97-52,DSb 21, PS 1347, SL 1104, DSb 32, RSC 10-70, KDS 921, NRC 125, RSC 10-71, DS 3106, RSC 10-52, JS 20-116, KDS 753, KDS 869, RUS 2007-6, RUS 2008-24, RUS 2008-8, EC 242104, GP 268
5	7	S	03	JS 335, KDS 726, KDS 780
6	9	HS	01	Bragg

Entries like RKS 18, DSb 28-3, DSb 23-2 and DSb 30-2showed moderately resistant reaction. The genotypes like VLS 58, VLS 59, VLS 63, VLS 89, SL 688, JS 97-52,DSb 21, PS 1347, SL 1104, DSb 32, RSC 10-70, KDS 921, NRC 125, RSC 10-71, DS 3106, RSC 10-52, JS 20-116, KDS 753, KDS 869, RUS 2007-6, RUS 2008-24, RUS 2008-8, EC 242104 and GP 268 were moderately susceptible and entries like JS 335, KDS 726

and KDS 780 are susceptible in reaction to pod blight disease, where, the only genotype i.e. Bragg was highly susceptible to pod blight complex in both the seasons of *kharif* 2016 and 2017 respectively.

Similar observations were obtained by Chavan *et al.*, (2018) screened 40 genotypes against pod blight disease of soybean among them MACS series viz., 1201, 1336, 1039 and 1140 showed moderately resistant reaction, JS335 is susceptible and genotype Bragg showed highly susceptible reaction to the disease. The results obtained by Sajeesh *et al.*, (2014) and Pancheshwar *et al.*, (2016) reported that JS 97-52 and JS 97-60 exhibited moderately resistant reaction to pod blight, JS 335 showed susceptible reaction. Whereas, DSb 21 is moderately susceptible and JS 93-05 is showed susceptible reaction to pod blight disease in soybean.

In conclusion, pod blight of soybean is caused by one or association of various pathogens. Hence the effort was made to identify the resistance source for all the pathogens under natural field epiphytotic conditions by evaluating the various available genotypes of soybean i.e. yield trial material, rust resistance germplasm lines and multiple disease resistance entries. These sources can be further utilized in contemporary resistant breeding programmes against pod blight of soybean in future.

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