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Screening of Pigeonpea Genotypes against Leaf Spot Incited by *Cercospora cajani*

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A B S T R A C T

Cercospora leaf spot caused by *Cercospora cajani* Henningsis one of the most important fungal diseases of Pigeon pea [Cajanus cajan (L.) Millsp.].Screening of IVT forty one, eleven IVT Early & Extra Early genotypes were undertaken in poly house conditions during 2017-18.A mong IVT forty one genotypes CRG-16-008 was found completely disease free genotype is statistically at par with RKPV-911significantly superior to other remaining genotypes and eleven IVT Early & Extra Early genotypes two AL 2211 and RKPV 705 genotype are immune or resistant against Cercospora *cajani*. AL211 and RKPV 705 were significantly superior over the PUSA 2018-5, AL 1992, PUSA-2018-3, AL 2207, RKPV 704, and PUSA 2018-4 and statistically at par with RVKT 314, PUSA 2018-2, and PUSA-2018-1.

Introduction

Pigeonpea [*Cajanus cajan* (L.)] is an important grain legume crop of rainfed agriculture in the semi-arid tropics. Besides Indian sub-continent, it is widely grown in Eastern Africa and Central America. It is not only an important source of protein, but also plays an important role in atmospheric nitrogen fixation into soil (Reddy *et al.*, 2012).Globally pigeonpea is cultivated in about on 4.7 million ha area with 3.69 million tonnes annual production. India accounts 78% of the global output with current production of 2.78 million tonnes from 3.5 million ha. In Madhya Pradesh Pigeonpea is grown in about 0.57 million ha with an annual production of 0.57 million tonnes.

The average yield of Pigeonpea in M.P. is 848 kg/ha which is much larger than the potential yield of crop (1500-2000 kg/ha). Several biotic and abiotic factors are responsible for reducing the yield (Anno. 2018).

Cercospora leaf spot inflicts heavy yield losses ranging from 23 to 96 per cent under natural epiphytotic conditions. (Kasno, 1990; Iqbal *et al.*, 1995; Kaur, 2007). The yield losses vary depending upon how early the crop is infected in the season, crop variety and prevailing weather. The leaf spot disease is caused by fungus *Cercospora cajani.* It is present in parts of Uttar Pradesh, Bihar and several places of south India (Reddy *et al.*, 2012).

Materials and Methods

Seeds

The seeds of pigeonpea were obtained from Department of Plant Pathology, R A K college of Agriculture, Sehore (M.P.).

Pathogenicity test (dubble inoculation method)

Plants were inoculated using a modified double inoculation technique of Van der Vossen and co-workers (1976). Conidial suspension of *Cercospora cajani* was applied on both sides of all the leaves present on the plant using a half litre Baygon atomiser (Bayer East Africa Ltd) held at a distance of 10-15 cm away until run off. A double inoculation at 48 hour interval was applied. Control plants were inoculated with sterile distilled water. To maintain high humidity, inoculated plants were covered with transparent plastic bags for 96 hours and thereafter the covers were removed. To increase leaf wetness plants were sprayed with water at least twice a day.

The plants were incubated for a total of 35 days in the polyhouse where the average temperatures were 20 - 26°C. Daily observations on symptom development were made until the first appearance of symptoms. For pathogenicity test, 15 and 120 day old pigeonpea plants of susptible genotype (ICP-2376) were used.

The test was conducted after isolation in order to prove that the organism isolated was the causal agent of Cercospora leaf spot. Leaves showing characteristic Cercospora leaf spot symptoms were detached 35 days after plant inoculation and re-isolation of the pathogen was carried out to fulfill Koch's postulates.

Table.a Disease rating scale

Disease grade	Description	Disease grade	Disease reaction
0	No symptom	0-1	**Immune**
1	Lesion small pin head covering less than 1% leaf	1.1-3	**Resistant**
3	Lesion 1-2 mm diameter covering 1-10 % leaf area	3.1-5	**Moderately Resistant**
5	Enlarged lesion with 11-25 % leaf coverage	5.1-7	**Moderately Susceptible**
7	Lesion covering 26-50% of the leaf area	7.1-9	**Susceptible**
9	**More than 50% of the area covered by large coalescing lesion and defoliation**		**Highly Susceptible**

Results and Discussion

Screening evaluation of pigeonpea IVT medium entries against cercospora leaf spot (CLS)

A total of 41 pigeonpea genotypes were evaluated against cercospora leaf spot (*Cercospora cajani*) during 2018-19 and the results are presented in (Table-1). Out of forty one genotypes, nine genotypes viz., IPA 15-01, IPA15-07,IPA16E -10, RKPV912, RPS2007-109, RVSA-15-7, TDRG-59, TRG-111,WRGE-122 were free from disease and fall in resistant category (0-10%). Seventeen genotypes were AKTE1701, AKTE12-02, AKTE12-04, BDN2013-1, BRGL-18-2, GTP-1715, BRGL-18-1, IBTDRG-7, IPA15-06, IPA17E-01,IPA15-2,IPAIM16-3, PADT-16, RPS2001-105-1, RVSA-14-1,RVSA15-10, WRGE-126 were under (11-25%). Twelve BAUP-15-19, GJP-1721, IPA-16-18, IPAM16-18, IPAM16-6, KRG-224, KRG-244, LRG-229, PTO705-4-1-2, RPS-2008-5, SKNP1413, WRGE127, WRGE121(26-50%). ICP 2376(S-ch) genotype found was placed in category of highly susceptible.

CRG-16-008 was found completely disease free genotype is statistically at per with RKPV-911significantly superior to other remaining genotypes.

Table.1 Screening of pigeonpea IVT Medium entries genotypes against Cercospora leaf spot

S. No	Entries	PDI	Mean grade	S. No	Entries	PDI	Mean grade
1	AKTE 1701	22.76 (28.47)	MS	21	KRG-224	28.30 (32.12)	**S**
2	AKTE 12-02	13.36 (21.28)	MS	22	KRG-244	46.05 (42.72)	**S**
3	AKTE 12-04	16.50 (23.10)	MS	23	LRG 229	29.20 (32.68)	**S**
4	BAUP-15-19	26.10 (30.22)	S	24	PADT-16	22.25 (28.11)	**MS**
5	BDN 2013-1	13.10 (21.10)	MS	25	PT 0705-4-1-2	26.95 (31.26)	**S**
6	BRGL-18-1	15.50 (23.16)	MS	26	RKPV 911	0.35 (2.40)	**R**
7	BRGL-18-2	19.40 (26.10)	MS	27	RKPV 912	2.55 (9.17)	**MR**
8	CRG-16-008	0.00 (0.00)	I	28	RPS 2007-105-1	13.91 (21.70)	**MS**
9	GJP-1715	22.75 (28.46)	MS	29	RPS 2007-109-1	10.60 (18.99)	**MR**
10	GJP-1721	39.95 (39.15)	S	30	RPS-2008-5	29.20 (32.69)	**S**
11	IBTDRG-7	15.50 (23.13)	MS	31	RVSA-14-1	13.50 (21.54)	**MS**
12	IPA 15-01	7.70 (16.10)	MR	32	RVSA-15-7	5.70 (9.86)	**MR**
13	IPA 15-06	15.85 (23.45)	MS	33	RVSA 15-10	16.00 (23.57)	**MS**
14	IPA 15-07	4.55 (11.95)	MR	34	SKNP 1413	46.10 (42.75)	**S**
15	IPA 16E-10	10.75 (19.07)	MR	35	TDRG-59	6.95 (15.28)	**MR**
16	IPA 17E-01	16.60 (23.99)	MS	36	TRG-111	2.80 (6.84)	**MR**
17	IPA-15-2	22.20 (28.09)	MS	37	WRGE 127	28.35 (31.92)	**S**
18	IPA-16-18	35.60 (36.61)	S	38	WRGE-121	36.85 (37.35)	**S**
19	IPAM 16-3	11.70 (19.95)	MS	39	WRGE-122	15.50 (23.16)	**MR**
20	IPAM 16-6	40.25 (39.36)	S	40	WRGE-126	50.25 (45.13)	**MS**
				41	ICP 2376(S-ch)	62.75 (54.89)	**HS**
Sem± CD						**2.88**	
						6.66	

(*Figures in parentheses are arcsine transformed values**)**

Table.1.2 Reaction of entries against leaf spot of pigeonpea (IVT Medium)

Reaction	No. of entries	Entries
Resistant	02	**CRG-16-008, RKPV 911**
Moderately resistant	09	**IPA 15-01, IPA 15-07, IPA 16E-10, TDRG-59, TRG-111,WRGE-122, , RVSA-15-7, RPS 2007-109-1, RKPV 912,**
Moderately susceptible	17	**AKTE 1701,WRGE-126, AKTE 12-02, AKTE 12-04, BDN 2013-1, BRGL-18-1, BRGL-18-2, GJP-1715, IBTDRG-7, IPA 17E-01, IPA-15-2, IPAM 16-3, IPA 15-06, RVSA 15-10, PADT-16, RVSA-14-1 RPS 2007-105-1,**
Susceptible	12	**BAUP-15-19,GJP-1721,IPA-16-18,IPAM16-6,KRG-244, KRG-224, LRG 229, PT 0705-4-1-2, RPS-2008-5, SKNP 1413, WRGE-121, WRGE 127**
Highly susceptible	**01**	**ICP 2376 (S-ch),**

Table.2 Screening Evaluation of pigeonpea IVT Early & Extra Early entries against Cercospora Leaf Spot (CLS)

S.No	Entries	PDI	Grade
1	AL 1992	17.2 (24.47)	**MS**
2	AL 2207	25.1 (30.04)	**MS**
3	AL 2211	0 (0.00)	**R**
4	PUSA 2018-2	6.15 (14.34)	**MR**
5	PUSA 2018-4	42.75 (40.77)	**S**
6	PUSA 2018-5	14.05 (21.92)	**MS**
7	PUSA-2018-1	7.9 (16.32)	**MR**
8	PUSA-2018-3	23.3 (28.82)	**MS**
9	RKPV 704	34.4 (35.89)	**S**
10	RKPV 705	0 (0.00)	**R**
11	RVKT 314	5.4 (13.25)	**MR**
CD at 5%		**5.68**	
Sem±		**1.78**	

(*Figures in parentheses are arcsine transformed values**)**

Table.2.1 Reaction of entries against leaf spot of pigeonpea (IVT Early & Extra Early)

Reaction	No. of entries	Entries
Resistant or Immune	02	**RKPV 705, AL 2211**
Moderately resistant	03	**RVKT314, ,PUSA-2018-1, PUSA 2018-2,**
Moderately susceptible	04	**AL-1992, AL2207, PUSA2018-5, PUSA208-3**
Susceptible	02	**PUSA2018-4, RKPV704**
Highly susceptible	**00**	**Nil**

IVT early & extra early trial screening against cercospora leaf spot of pigeonpea

Total 11 pigeonpea genotypes were selected for screening. The data summarized in (table-2) reveals that the minimum disease incidence was recorded in AL 2211 and RKPV 705 (0.00%) respectively followed by RVKT 314 (5.4%), PUSA 2018-2 (6.15%), PUSA-2018-1(7.90 %), PUSA 2018-5 (14.05%), AL 1992 (17.20 %), PUSA-2018-3 (23.3%),AL 2207 (25.10%), RKPV 704 (34.40%), while maximum disease incidence was recorded in PUSA 2018-4 (42.75%).

In these IVT trial two AL 2211 and RKPV 705 genotype are immune or resistant against *Cercospora cajani*. AL211 and RKPV 705 was significantly superior over the PUSA 2018-5, AL 1992, PUSA-2018-3,AL 2207, RKPV 704, and PUSA 2018-4 and statistically at par with RVKT 314, PUSA 2018-2, PUSA-2018-1.

Screening of IVT trial 11 genotypes are tested as per disease reaction, two genotypes are found to be resistant category, three genotypes are belonging to moderately resistant, and however four genotypes was placed in moderately susceptible. None of the genotype was placed in category of susceptible and highly susceptible(Table-2).

(Booker *et al.,* 2007) selected 12 cowpea cultivars were screened for resistance to Cercospora leaf spot (CLS) disease caused by *Pseudocercospora cruenta* and *Cercospora apii* s. lat. under artificial epiphytotic conditions in a replicated field trial.

(Iqbal *et al.,* 2009) evaluated 100 mungbean germplasm against leaf spot disease caused by *Cercospora canescens* under artificially inoculated disease condition in the field. There was a considerable variation among the genotypes with respect to disease reaction. Disease rating scale of 1-5 was used for the evaluation of resistance of mungbean accessions. Eleven accessions; 013987, 013929, 014219, 014240, 014241, 014243, 014245, 014258, 014259, 014293 and 014309 were found highly resistant with disease rating score 1.1-3 with disease rating score 2 showed resistant reaction against the disease while 30 exhibited the moderately resistant (tolerant) reaction. Rest of the accessions with disease rating 4-5 were either susceptible or highly susceptible.

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