



HOST RANGE, SUSCEPTIBILITY PERIOD OF *Curvularia lunata* CAUSING LEAF SPOT OF BLACK GRAM AND GERMPLASM SCREENING

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ABSTRACT

Curvularia lunata, causal organism of leaf spot of black gram (*Vigna mungo* L.) was able to infect most of the plants species belonging to the family Leguminaceae, Cucurbitaceae, Compositae, Solanaceae, Malvaceae and Graminae. Only plants belong from family Euphorbiaceae were free from infection by artificial inoculation of the pathogen. The maximum and minimum disease intensity was recovered at 60 days old and 30 days old plants, respectively. 48 varieties/cultures of black gram were screened under natural conditions to test their resistant against *C. lunata*. Out of these 9 varieties/cultures were found free (no infection) 10 resistant (1-5% leaf area infected) 12 moderately resistant (6-15% leaf area infected), 4 susceptible (16-25% leaf area infected) and 13 highly susceptible (26-40% and above leaf area infected). Subsequently, the germplasm with free resistant, moderately resistant reaction were further screened under artificial inoculation during the *khariif* season. 12 varieties/cultures were found resistant, 12 were moderately resistant. None of the varieties/cultures was free from infection.

Key Words : *Curvularia* leaf spot, Black gram, Varieties/Culture, host range and susceptibility.

Urdbean or Black gram (*Vigna Mungo* L.), is one of the important *khariif* pulses crop, grown throughout the country. India is the largest producer and consumer of black gram in the world. The crop is improving the soil fertility by fixing atmospheric nitrogen in the soil. *Curvularia* leaf spot of black gram caused by *C. lunata* (Wakker) Boedijn is the most serious fungal disease of this crop. A similar leaf spot disease of Urdbean (*Vigna mungo* L.) was first reported by Singh and Singh 1973,

in India from the department of Plant Pathology of Chandra Shekhar Azad University of Agriculture & Technology, Kanpur. The fungus was able to cause the infection from the emergence to harvesting the age of the plants. As disease appeared in different weeds and other crops also with different severity range. Since, resistant varieties are one of the important components for the managing of the disease. It is also essential that which stages *C. lunata* is most active for causing

infection to the crop. The present study was aimed to study host range, susceptibility period and finding out resistant sources in black gram germplasm against *Curvularia* leaf spot of black gram.

MATERIALS AND METHODS

Host range:

The fungus *Curvularia lunata* is known to occur on a wide variety of hosts. The host range study was carried out to test the pathogenic ability of the fungus on important field crops, weeds plants belonging to seven different families (58 plant species) were selected were artificially inoculated in their respective seasons by the pathogen. Healthy leaves of one month old plants were inoculated with spraying spores suspension of the pathogen. Spore suspension was prepared in double distilled water and concentration (6×10^6 /ml) was adjusted with the help of hemocytometer. The inoculated leaves were covered with polythene bags for 48 hrs. Observations were recorded 15 days after inoculation. The details of the plants were used for testing the host range was mentioned in Table 1

Susceptibility period :

Experiment was conducted to find out the stage of the growth when black gram plants are most susceptible to infection against *C. lunata*. The surface sterilized seeds of black gram cv. T-9 grown in sterilized soil filled in 30 cm pots in the glass house. Three plants per pot were maintained for each as replicated three times. For maintaining plants of different growth stage, sowing was started from July 2003 and continued up to October, 2003 at an interval of 15 days. The plants in different sets of pots attained the age of ranging from 15 to 105 days on October, 2003. Spore suspension was prepared as above mentioned. Plants without inoculation

served as control. The inoculated plants were incubated for 48 hrs in moist chamber by covering plants with polythene bags. Final observations of disease symptoms were recorded 15 days after inoculation. The most susceptible growth period of the host was calculated from the date of sowing.

Germplasm screening :

Germplasm screening was conducted in two year at Economic Botanist (*Legume*) C.S.A. University of Agriculture and Technology, Kanpur. First year (kharif-2002) and second year (kharif-2003) were tested in natural and artificial condition respectively. The varieties/cultures found free, resistant, moderately resistant under natural condition during 2003, was also tested in glass house condition. Three plants were maintained in each pot, when the age of crop was one month from date of showing the plant were inoculated with spore suspension (6×10^6). The reaction was noted after one week inoculation and the intensity on disease development was assessed at regular interval. Following disease reaction scale was used

RESULTS AND DISCUSSION

Host range :

It is evident from the table 1 that *C. lunata* was able to infect 24 plants species belonging to different families are Leguminaceae, Cucurbitaceae, Compositae, Solanaceae, Malvaceae and Graminae showed extensive leaf spot also. In leguminaceae: *Vigna radiata*, *Glycine max*, *Arachis hypogea*, *Vigna mungo*, *Vigna sinensis*, *Crotolaria juncea* and *Trifolium alexandrianum* were showed symptoms. In gramineae, *Oryza sativa*, *Zea mays*, *Pennisetum typhoides* and in Malvace, *Gossypium hirsutum*, *G. herbaceium* and *G. arboretum* were infected with *C.*

Categories of Disease Reaction

Grade	Reactions	Descriptions
0	Free	No infection
1	Resistant	1-5 percent leaf area affected
2	Moderately Resistant	6-15 percent leaf area affected
3	Moderately Susceptible	16-25 percent leaf area affected
4	Susceptible	26-40 percent leaf area affected
5	Highly Susceptible	above 40 percent leaf area affected

lunata. Minimum disease infection was observed on plants belonging to family Solanaceae. There is no infection was observed on plants belonging to Euphorbiaceae family.

Susceptibility period :

The susceptibility of the plants to fungal infection

Table 1: Host range study of *Curvularia lunata* causing leaf spot of black gram

Family	Scientific Name	Infection Reaction
Leguminaceae	<i>Cajanus cajan</i> L. (mill sp.)	-
	<i>Vigna radiata</i> L. Coilzek	+
	<i>Cicer arietinum</i> L.	-
	<i>Glycine max</i> L. merril	+
	<i>Arachis hypogea</i> L.	+
	<i>Vigna mungo</i> (L.) Hepper	+
	<i>Pisum sativum</i>	-
	<i>Vigna sinensis</i>	+
	<i>Lens esculenta</i>	-
	<i>Dolichus lablab</i>	-
	<i>Cyamopsis tetragonoloba</i> (L.) Tanb	-
	<i>Crotolaria juncea</i>	+
	<i>Trifolium alexandrianum</i> L.	+
	Cucurbitaceae	<i>Citrullus vulgaris</i> var. <i>fistu losus</i>
<i>Citrullus lanatus</i>		+
<i>Cucumis sativus</i> L.		-
<i>Cucumis melo</i>		-
<i>Cucumis utilissimus</i>		-
<i>Trichosanthes anguina</i>		+
<i>Mamordica charantia</i>		-
<i>Luffa acutangula</i>		-
<i>Luffa cylindrica</i>		-
<i>Lagenaria siceraria</i>		-
Compositae	<i>Helianthus annus</i> L.	+
	<i>Zinnia elegans</i> L.	+
	<i>Dahlia</i> spp. L.	+
	<i>Carthanum tinctorius</i> L.	+
	<i>Chrysanthimum maximum</i> L.	-
	<i>Helianthus agrophyllus</i> L.	-
	<i>Helianthus cucumerifolius</i>	+
	<i>Tagetes erecta</i> L.	+
	<i>Lactuca sativa</i>	-
	<i>Helianthus tuberosus</i>	+

Table 1 Contiune

Solanaceae	<i>Capsium annum</i> L.	-
	<i>Lycopersicon lycopersicum</i>	-
	<i>Solanum melongnea</i> L.	+
	<i>Solanum nigrum</i> L.	-
	<i>Solanum tuberosum</i> L.	-
Malvaceae	<i>Nicotiana tobaccum</i>	+
	<i>Abelmoschus esculentus</i> L.	-
	<i>Gossypium hirsutum</i> L.	+
	<i>Gossypium arboreum</i>	+
	<i>Gossypium herbaceum</i>	+
	<i>Hibiscus esculentus</i>	-
Gramineae	<i>Avena sativa</i>	-
	<i>Hordeum vulgare</i> L.	-
	<i>Oryza sativa</i> L.	+
	<i>Sacchrum officinarum</i> L.	-
	<i>Sorghum vulgare</i>	-
	<i>Triticum aestivum</i> L.	-
	<i>Zea mays</i> L.	+
	<i>Pennisetum typhoides</i>	+
	<i>Panicum maximum</i> Ja cq.	-
	<i>Pennisetum perpureum</i> L.	-
<i>Pennisetum polystachyon</i> L.	-	
Euphorbuaceae	<i>Euphorbia hitra</i> L.	-
	<i>Phylanthus niruri</i> L.	-
	<i>Ricinus communis</i> L.	-

Note: (+) Infected, (-) Not infected

varied according to age on increasing the age of the plants, the disease intensity increased but this trend was noted up to 60 days age of the plants (Fig. 1). The decrease intensity was gradually decreased as the plants progressed towards maturity. The maximum disease intensity was noted as 60 days and the minimum at 30 days old plants. The 75 days old plants age were less susceptible as the infection gradually reduced slightly infection, the spot were produced on lower surface of the leaves only when the plants were 90 days old. Similar observations were recorded by Choudhary *et al.* (2011) reported that *C. lunata* caused maximum disease when inoculations were made on 60-days old plant of maize.

Screening of black gram varieties/cultures :

The results given in table 2 revealed that out of 48 varieties/cultures screened under natural conditions, Nine (9) were founds free (No Infection), 10 resistant (1-5% leaf area infected) 12 moderately resistant (6-15% leaf area infected), 4 Susceptible (16-25% leaf area infected) and 13 highly Susceptible (26-40% and above

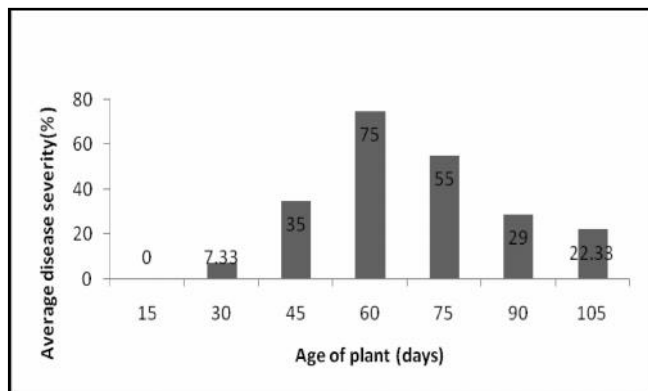


Fig 1 : Susceptibility of black gram plant at different ages with *C. lunata*

leaf area infected). Subsequently the germplasm with free resistant moderately resistant reactions were further screened under artificial inoculation during the Kharif season of 2003. Finally only 12 varieties/cultures found resistant and 12 were moderately resistant. None of

the varieties/culture was free from infection. These varieties could be used for management of *C. lunata*. Leaf spot is a devastating disease of black gram in India that may cause up to 50% yield losses under epidemic condition. The host plant resistance is the most feasible and economical measure to reduce yield losses due to this disease. Identification of resistant sources is an important pre-requisite for initiation of breeding program aimed at developing resistant varieties. Our study revealed a considerable variability among black gram germplasm for resistance against this disease both under natural and artificial conditions. More genotypes were found resistant in the natural condition than artificial condition. Iqbal *et al.*, (2010) reported that black gram genotypes showed resistance against different fungal pathogen. Amundsen *et al.* (2012) also screened distinct buffalo grass genotypes against the fungal pathogen *C. lunata*, causes leaf spot disease of buffalo grass.

Table 2 : Level of Resistance/Susceptible of Various Varieties/cultures against *Curvularia* leaf spot of black gram

Rating in scale 0-5	Disease Reaction	Varieties/cultures under natural conditions	Varieties/cultures under artificial conditions
0	Free	Shekhar -1,Shekhar -2,Shekhar - 3,Azad - 1,Pant U-19,Pant U-30, UG 218, PDU - 1,PDU - 88-31	Nil
1	Resistant(1-5% leaf area infected)	T-9,UG - 177,BG - 369,PDU - 31,UG - 27,SYM - 6,PDU - 110,KU - 313,KU - 311,KU - 300	Azad - 1,Pant U - 19,Pant U - 30, UG - 218, Shekhar - 1, Shekhar - 2, Shekhar - 3,PDU - 88-31,PDU - 1,KU - 300, PDU - 110
2	Moderately resistant(6-15% leaf area infected)	KU-307,KU- 305,KU - 301,KU - 213,KU 814A,KU - 820,KU - 96-3,IPU- 96-6,UH 186-54,PLU - 429,IPU - 99-43,IPU - 99-82	T-9,UG - 177,BG - 369,PDU - 31,UG - 27, SYM - 6,KU - 313, KU - 311, KU - 305, KU - 301, KU - 820,KU-307
3	Susceptible(16-25% leaf area infected	LU - 338,Barabanki local, KU - 315,KU - 814B	Nil
4	Highly Susceptible(26-40% leaf area infected	PGRW - 95022,UG 83-2,UG - 81-59,KC - 143,NKDU - 2,PDU - 14,PLU - 277 UG - 99-8, IPU - 99-230,IPU - 99-228,KU- 304,KU - 309,KU - 608	Nil
5	Highly Susceptible(above 40 percent leaf area affected)	Nil	Nil

Acknowledgements :

The authors are grateful to the Head, Department of Plant Pathology, C.S.A. Univ. of Agri. & Tech., Kanpur for providing necessary facilities for conducting the research and needful guidance.

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