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SCREENING OF SESAME GERMPLASM FOR RESISTANCE AGAINST THE BACTERIAL BLIGHT CAUSED BY *Xanthomonas campestris* pv. *sesami*

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Screening of sesame germplasm, 20 from Faisalabad and 119 from NARC, Islamabad was done for resistance against the sesame bacterial blight (*Xanthomonas campestris* pv. *sesami*) which is posing great threat to sesame in Pakistan. Among the 20 varieties screened in Faisalabad, no line was found immune, highly resistant or resistant. Among all, 4 lines were found moderately resistant, 14 were moderately susceptible and 2 observed to be highly susceptible. Results of screening of germplasm at NARC revealed that out of 119 lines, none was immune to the bacterial blight, whereas 3 lines i.e. SG-34, SG-22, SG-55 were highly resistant, 2 lines, i.e. SG-72, SG-33 were marked as resistant, 10 lines were found to be moderately resistant, 49 lines were categorized as moderately susceptible, 40 were susceptible and the highly susceptible group comprised of 15 lines.
Keywords: sesame, *Xanthomonas campestris* pv. *sesami,* germplasm**,** disease resistance

INTRODUCTION

Sesame (*Sesamum indicum* L.) is a worthwhile oil seed and cash crop, particularly, of rain fed areas (Bedigian, 1985). Pakistan stands at 14th position in sesame production. The oil seed crops in Pakistan are mainly sesame, linseed, rapeseed, mustard seed, and castor.

Sesame is known to be susceptible for the number of diseases. It has been reported to be the host of many diseases that include bacterial blight (*Xanthomonas campestris* pv. *sesami*), bacterial leaf spot (*Pseudomonas syringae*), Alternaria leaf spot (*Alternaria sesame*) (Cook, 1981), Cercospora leaf spot (*Cercospora sesame*) (Hansford, 1931), and damping off or root rot (*Macrophomina phaseolina*). Virus and virus like organisms, causing diseases such as mosaic, leaf curl and phyllody, have also been reported (Roy, 1931).

For the first time in Pakistan, bacterial blight was discovered in 1986 in July-September (Akhtar, 1986). The disease becomes more damaging when continuous condition of humid weather prevails. Presently, this disease has emerged as very damaging and posturing peril in Pakistan (Ahmed, 2004).

Habish and Hammad (1970) found that the bacterial leaf blight is devastating and often instigate remarkable damages to the crop especially in the Monsoon season. Under favorable conditions i.e. soil moisture (30-40 %) and relative humidity (75-85 %), acute losses have been reported. Seed infection is one of the major causes for the dispersal of diseases and the resulting plants have poor growth (Kottle, 1985). The pathogen, *Xcs*, persists 4-6 months in the soil while 16 months on the seed giving rise to poor seedlings (Habish and Hammad, 1970).

In addition to causing disease on host plants, several plant pathogenic bacteria, including Xcs, induce a hypersensitive response (HR) when inoculated to incompatible host or non-host plants (Goodman & Novacky, 1994). Plants are resistant to infection by many pathogens. Plants expressing a resistance (R) gene rapidly initiate defense responses following contact with a pathogen that expresses a corresponding avirulence (avr) gene (Flor, 1971). Isogenic plants lacking the R gene fall prey to the pathogen. The hypersensitive response (HR), a rapid cell collapse at the site of infection, is often dramatic evidence of resistance, particularly in bacteria-induced HR (Goodman and Novacky, 1994; Heath, 2000).

Since the pathogen is soil borne and can persist in soil for 6 months and 16 months in seed, and upon getting the favorable conditions it can appear as epidemic. Therefore, we must find the solution to stop it from being epidemic. The ideal and most economical mean of managing the sesame bacterial blight would be the use of resistant varieties. Under these circumstances there is a need to exploit genetically host resistance in existing sesame commercial varieties and germplasm for the identification of resistant sources.

MATERIALS AND METHODS

Planting of the germplasm was done in June-July 2008 in Faisalabad and NARC Islamabad under natural conditions. The seeds were sown at the distance of 45 cm at the depth of 2-2.5 cm. Twenty varieties were sown in Faisalabad and 119 lines in NARC, Islamabad for evaluating them against the bacterial blight of sesame. The inoculum of *Xanthomonas campestris* pv. *sesami* was applied into the soil at 1x10^7

cfu/ml. The data was collected after 2 to 3 months i.e. in September-October 2008. All these varieties/lines were then assessed on the basis of disease rating scale following Sarwar *et al.* (2006).

Scale	Infection	Category
0	0%	Immune
1	0.1-5%	Highly Resistant
2	5.1-10%	Resistant
3	10.1-20%	Moderately Resistant
4	20.1-50%	Moderately Susceptible
5	50.1-70%	Susceptible
6	> 70 %	Highly Susceptible

RESULTS AND DISCUSSION

Screening of the sesame varieties done at Faisalabad revealed that among twenty varieties, none was found immune, highly resistant or resistant, four varieties found to be moderately resistant (10.1-20% incidence), 95001, 96007, 96019, 20003 with 13.04%, 15.55%, 12.50%, 19.05%, respectively, were rated as moderately resistant. Fourteen varieties found to be moderately susceptible (20.1-50% bacterial blight incidence), black Til, Til-89, T.S-3, 96006, 97004 etc. and two found to be highly susceptible (>70% incidence), Tilhan black, Tilhan sufad with 75.00%, 70.9% disease incidence, respectively (Table 1). It could be noticed that the vulnerability level was relatively high as compared to weakly resistant status.

Screening of the sesame germplasm grown at NARC, Islamabad, Pakistan, was done. Out of 119 sesame lines included 3 highly resistant SG-34 with 3.57%, SG-22 with 7.5% and SG-55 with 3.14%. Two varieties were marked as resistant i.e. SG-72 and SG-33 with 9.43% and 9.09% disease incidence respectively. Ten lines were recorded to be moderately resistant in which disease incidence was found to be 10.1-20%. These lines were SG-10 (13.95%), SG-17 (20.83%), SG-24 (20%), SG-63 (13.95%), SG-71 (17.77%), SG-76 (20%), SG-111 (20%), SG-117 (19.35%), SG-118 (16.67%) and SG-119 (10.34%). Forty nine lines were found moderately susceptible towards the sesame bacterial blight disease, among them SG-1, SG-4, SG-5, SG-6, SG-7, SG-20 with 26.66%, 33.33%, 30.36%, 21.28%, 40%, 25.71% infection respectively, showed relatively high incidence of disease that ranged between 20.1-50 percent.

The susceptible group comprised of 40 lines; SG-2, SG-3, SG-8, SG-9 {TS-3}, SG-13, SG-15, SG-18, SG-25, SG-27, SG-31 with 54.17%, 55.13%, 60.17%, 54.17%, 56%, 52%, 55.17%, 54.17%, 55.17%, 56.17% infection respectively.

The highly susceptible group comprised of 15 lines; SG-19, SG-21, SG-23, SG-25, SG-39, SG-49, SG-50 with 72.50%, 73.09%, 71.57%, 70.17%, 71.42%, 76.1% infection, respectively. Maximum bacterial blight symptoms were observed in the completely stunted plants.

Different researchers evaluated the sesame germplasm and our results are in accordance of those in some cases where there is some deviation so this may be due to environmental factors, different genotypes and pathogen races. At NARC for bacterial blight, 29 and 16 entries of sesame were screened and evaluated under National Uniform Sesame Yield Trial (NUSYT). On the basis of disease severity index, entries varied only slightly in their reaction to blight but none was found to be free from the disease, 13 lines appeared to be moderately susceptible to moderately resistant producing satisfactory yields.

McBee and Lyda (2000) screened out germplasm of numerous lines of sesame in the field and green house conditions against bacterial blight at the Texas Agricultural Experiment Station, USA. They also used diverse chemicals to curb the disease in sesame resulting in a 10 percent increase in yield compared to prone varieties.

Thomas and Orellana (1962) reported that different levels of resistance were shown by the varieties Margo, Venezuela 51 and early Russian to different races of *Xanthomonas sesami* during the experiments conducted in the field and observatory. It was also noted that Venezuela 51 and Delco were more susceptible, whereas the variety Early Russian was resistant.

Table 1. Varieties/lines in which sesame bacterial blight incidence was recorded at Faisalabad

Disease incidence (%)	Category	No. of genotypes	Genotypes
0	Immune	nil	---------
0.1-5	Highly resistant	0	---------
5.1-10	Resistant	0	---------
10.1-20	Moderately resistant	4	95001, 96007, 96019, 20003
20.1-50	Moderately susceptible	14	Black Til, Til-89, T.S-3, 96006, 97004, 90005, 96002, 97019, 97007, 98002, 96020, 20005, 20006, 20011
50.1-70	Susceptible	0	---------
>70	Highly susceptible	2	Tilhan black, Tilhan sufad

Table 2. Screening of sesame germplasm grown at NARC, Islamabad, Pakistan

Disease incidence (%)	Category	No. of genotypes	Genotypes
0	Immune	nil	---------
0.1-5	Highly resistant	3	SG-55, SG-34, SG-22
5.1-10	Resistant	2	SG-72, SG-33
10.1-20	Moderately resistant	10	SG-10, SG-17, SG-24, SG-63, SG-71, SG-76, SG-111, SG-117, SG-118, SG-119
20.1-50	Moderately susceptible	49	SG-1, SG-4, SG-5, SG-6, SG-7, SG-11, SG-12, SG-14, SG-16, SG-20, SG-28, SG-29, SG-30, SG-35, SG-36, SG-38, SG-40, SG-44, SG-45, SG-52, SG-58, SG-59, SG-62, SG-65, SG-66, SG-74, SG-78, SG-79, SG-82, SG-83, SG-85, SG-87, SG-90, SG-93, SG-94, SG-95, SG-96, SG-97, SG-100, SG-101, SG-104, SG-109, SG-110, SG-114, SG-116
50.1-70	Susceptible	40	SG-2, SG-3, SG-8, SG-9, SG-13, SG-15, SG-18, SG-25, SG-27, SG-31, SG-32, SG-37, SG-40, SG-42, SG-42, SG-43, SG-46, SG-47, SG-48, SG-53, SG-54, SG-56, SG-57, SG-60, SG-75, SG-80, SG-81, SG-84, SG-86, SG-88, SG-89, SG-98, SG-99, SG-102, SG-103, SG-105, SG-106, SG-108, SG-112, SG-113, SG-115
>70	Highly susceptible	15	SG-19, SG-21, SG-23, SG-26, SG-39, SG-49, SG-50, SG-51, SG-61, SG-64, SG-69, SG-77, SG-91, SG-92, SG-107

Asad *et al.* (2004) found disease severity under natural field conditions while evaluating 29 sesame entries during their extensive research on bacterial blight conducted at National Agriculture Research Centre (NARC), Islamabad, Pakistan. Thirteen entries were planted in the early National Uniform Sesame Yield Trial (NYUST). They showed different degrees of disease. While among 16 entries of National Uniform Sesame Yield Trial (NYUST), none of the entries was found disease free.

Durgapal *et al.* (1969) in India examined seventy local and forty nine foreign sesame varieties in field test to find the presence of bacterial pathogens associated with sesame bacterial blight. He reported *Xanthomonas* and *P. sesami* was found among all the varieties evaluated in the field test.

Prasad *et al.* (1997) reported bacterial leaf spot of sesame which was effecting the plant at all ages and causing the widespread blight of the leaves, flowers, stem and petioles resulting in leaf dropping, sterility particularly when the wet weather prevailed or little rains developing the high relative humidity especially at nights. Symptoms of the disease were also implored. The isolated bacterium was identified as *Xanthomonas sesami.*

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