SHORT COMMUNICATION

SCREENING FOR RESISTANCE TO *MACROPHOMINA* ROOT ROT IN ADVANCED BREEDING LINES OF SESAME

T. Ezhilarasi and B. Meena*

Regional Research Station, Tamil Nadu Agricultural University, Vridhachalam – 606 001, Cuddalore District, Tamil Nadu

Received-08.05.2019, Revised-26.05.2019

Abstract: Root rot caused by *Macrophomina phaseolina* is the serious disease in sesame. The incidence of *Macrophomina* rot leads to great problems at such magnitude so that the area under sesame cultivation is declined gradually. Twenty four advanced breeding lines were screened for *Macrophomonia* root rot under sick plot conditions. The disease severity of root rot ranged from 17.4% to 41.6%. Advanced breeding lines *viz*., VS 16 004 and VS 16 008 recorded less disease incidence of 17.4% and 17.6% respectively, whereas the susceptible check VRI Sv 1 recorded the maximum disease incidence of 41.6%. However most of the lines were found to be moderately susceptible to root rot.

Keywords: Sesame, Screening, Root rot, *Macrophomina*

INTRODUCTION

Sesame (*Sesamum indicum* L.), is one of the oldest oilseed crop grown widely under tropical and subtropical regions in India. Although it has been cultivated for a long time, no significant increase in productivity has been achieved yet. The low productivity has been attributed to pests and disease occurrence (Buldeo and Rane, 1978). Among these, root rot caused by *Macrophomina phaseolina* (Tassi) Goid is the most serious one affecting the crop at the later stages of growth. It is the destructive disease in all sesame growing areas and causes about 5–100% yield loss as estimated by Vyas *et al*. (1984), while Maiti *et al*. (1988) reported an estimated yield loss of 57% at about 40% of disease incidence.

The most common symptom of the disease is the sudden wilting of growing plants mainly after the flowering stage, the stem and roots become black due to severe infection. The pathogen survives as sclerotia in the soil and crop residues and has also been reported to be seed-borne, characteristics that make it difficult to control. The disease is both seed and soil borne and usually infects the crop under dry and warm conditions. Sesame is mostly grown as a rainfed crop and under this situation, the crop is exposed to sufficient soil moisture during its initial growth stages (up to 30-35 days), while subsequently the crop is maintained as a dry crop. High temperature and water stress during growing season favours the pathogen's incidence (Chattopadhyay and Kalpana Sastry, 1998). Hence, the present study was taken up to assess the extent of damage caused by root rot disease in advanced breeding lines.

MATERIALS AND METHODS

Isolation, Purification and Multiplication of culture

Sesame (*Sesamum indicum* L.) plants showing typical root rot symptoms were collected and the isolation of fungus was done following the standard tissue isolation technique. Those parts of root and stem showing typical symptoms of the disease were washed in running tap water and cut into small bits. These bits were surface sterilized with 0.1 per cent mercuric chloride solutions for 30 seconds and washed thoroughly in sterile distilled water for three times to remove traces of mercuric chloride and then aseptically transferred to sterilized potato dextrose agar (PDA) plates and incubated at 27±1ºC for three days for fungal growth. Later, the bit of fungal growth was transferred to PDA slants. The pure culture of the fungus was obtained by further growing the culture under aseptic conditions by following hyphal tip culture method (Rangaswami, 1972). After seven days of incubation, pure isolates were obtained and maintained at 4ºC for further studies.

The pathogenic ability of *M. phaseolina* (isolated from the diseased stem) was tested in screen house on sesame. Culture of *M. phaseolina* was raised in 250 ml Erlenmeyer flask containing 50 ml of PDB (potato dextrose broth) sterilized at 15 lbs per sq inch pressure for 20 minutes. The bits of 5 mm size were cut with the help of sterilized cork borer from fresh pure culture plates (5 days old) and transferred into flasks with the help of sterilized needle under aseptic conditions. After seven days of incubation in BOD incubator at 27±1˚C, mycelial mats were collected and dried between folds of blotting paper for further use. Five gram of fresh mycelial mat was homogenized in blender for 2 minutes at lowest speed in 1000 ml of sterilized water. The suspension was used to inoculate the pots containing 5 kg of sand : ground sesame seed mixture (9:1) which was sterilized by autoclaving at 15 psi for one and half hours for two consecutive days. On the third day of inoculation, thirty seeds of sesame were sown in pots. Pots were irrigated regularly to maintain moisture. After 8-10 days of sowing, the symptoms appeared and the infected plants exhibited elongated

*Corresponding Author

lesions at collar region which will be later converted to dark brown to black and stem was completely girdled by the lesions. The affected plants wilted and dried up later. Diseased plants were brought to laboratory and isolations were made on PDA medium from diseased stem to confirm the identity of pathogen (Riker and Riker, 1936).

Soil inoculation technique under screen house conditions

Wheat grains/sorghum grains were kept in polypropylene bags (500 g/bag) and plugged with non absorbent cotton after putting plastic ring in the neck. Thereafter, bags were sterilized at 22 psi for 2 hours. The bits of pure cultured mycelium were placed in alternating layers of wheat and fungus mycelium and this set up was incubated for 10 days at 27±1 ºC to grow the fungus by utilizing the wheat grains to produce sufficient mycelial matter. Soil filled in earthen pots was mixed with inoculum in the screen house to allow maximum establishment.

Evaluation of advanced breeding lines for resistance to *Macrophomina* under sick plot

The field trial was conducted at new farm, Regional Research Station, Vridhachalam during *kharif* 2018 under sick plot conditions. Twenty four advanced sesame breeding lines along with the check were screened against *Macrophomina* root rot disease under field (sick plot) conditions in Randomized block design in two rows of 3 m length and replicated thrice. The root rot disease incidence was recorded at 70 days after sowing by counting the number of diseased plants and total plants. The advanced lines were graded as resistant, moderately resistant, moderately susceptible, susceptible or highly susceptible based on their infection percentage using the scale given by Dinakaran and Naina Mohammed (2001). The reaction of sesame genotypes to root rot disease was assessed and the results were furnished in Table 1.

Disease scale	Per cent infection (%)	Reaction
1	1-10	Resistant
3	11-20	Moderately resistant
5	21-30	Moderately susceptible
7	31-50	Susceptible
9	51-100	Highly susceptible

RESULTS AND DISCUSSION

Identification of disease resistant lines is a major goal for plant breeders. Breeding for disease resistance requires efficient, low-cost and rapid screening techniques (Foolad *et al*., 2000). In the present study, twenty four advanced breeding lines were evaluated along with the checks. Three types of disease response i.e., moderately resistant, moderately susceptible and susceptible reactions were observed in the present study. It was observed that three cultures *viz*., VS 16 004 (17.4%), VS 16 008 (17.6%) and VS 16 009 (19.4%) were found to be moderately resistant; whereas susceptible disease reaction was observed in VRI Sv 1 (41.6%). Sixteen sesame lines were observed to be moderately susceptible whereas rest of the lines were found susceptible to root rot disease. Although germplasm having perfect resistance (without symptom) to wilt disease was reported previously (El-Shazly *et al*., 1999), in this study, there was no perfect resistance was observed. However, the identified moderately resistant lines may be utilized for breeding programmes to broaden the resistance against *Macrophomina* root rot.

Table 1. Disease reaction of advanced breeding lines against *Macrophomina* root rot

Sl. No	Entries	Root rot %
1.	VS13 006	35.6
2.	VS15 001	29.3
3.	VS15 002	32.4
4.	VS15 004	39.7
5.	VS15 005	25.8
6.	VS15 007	28.3
7.	VS15 009	32.6
8.	VS15 011	25.1
9.	VS15 014	28.4
10.	VS15 015	32.7
11.	VS15 016	35.3
12.	VS 16 001	26.4
13.	VS 16 002	25.9
14.	VS 16 003	29.3
15.	VS 16 004	17.4
16.	VS 16 005	22.6
17.	VS 16 006	28.3
18.	VS 16 007	31.4

19.	VS 16 008	17.6
20.	VS 16 009	19.4
21.	VS 16 010	28.3
22.	VS 16 011	26.4
23.	VS 16 012	22.9
24.	VS 16 013	20.3
25.	VRI 3	22.6
26.	TMV 7	24.9
27.	VRI 1	41.6
	CD (P=0.05)	3.6

REFERENCES

Buldeo, A.M. and Rane, M.S. (1978). Fusarium wilt of *sesamum*. J Maharashtra Agric Univ. 3: 167-170.

Chattopadhyay, C. and Kalpana Sastry, R. (1998). Important diseases of sesame and their management options. In: IPM systems in Agriculture, (Oilseeds), RK Upadhyay, KG Mukerjie, RL Rajak (eds.), Oxford and IBH Publ., New Delhi.

Dinakaran, D. and Naina Mohammed, S.E. (2001). Sesame and Safflower Newsl. 16: 68-71.

EL-Shazly, M.S., Abdul Wahid, O.A., EL-Ashry, M.A., Ammar, S.M. and EL-Bramawy, M.A. (1999). Evaluation of resistance to Fusarium wilt disease in sesame germplasm. International Journal of Pest Management. 45: 207–210.

Foolad, M.R., Ntahimpera, N., Christ, B.J. and Lin, G.Y. (2000). Comparison of field, greenhouse, and detached-leaflet evaluations of tomato germplasm for early blight resistance. Plant Disease. 84: 967-972.

Maiti, S., Hegde, M.R. and Chattopadhyay, S.B. (1988). Handbook of Annual Oilseed Crops. Oxford and IBH Publ. Co. Pvt. Ltd., New Delhi.

Rangaswami, G. (1972). Diseases of crop plants in India. Prentice Hall of India Pvt. Ltd. New Delhi, 520p.

Riker, A.J. and Riker, A.S. (1936). Introduction to research on plant diseases. John. S. Swift, C.M.C., New York, 117p.

Vyas, S.C., Kotwel, T., Prasad, K.M.V. and Jain, A.C. (1984). Notes on seed-borne fungi of sesamum and their control. Seed Res. 12: 93-94.