



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(3): 1865-1867
Received: 19-03-2019
Accepted: 21-04-2019

M Kabi
Department of Plant Breeding
and Genetics, College of
Agriculture, OUAT,
Bhubaneswar, Odisha, India

B Baisakh
Department of Plant Breeding
and Genetics, College of
Agriculture, OUAT,
Bhubaneswar, Odisha, India

M Dash
Department of Plant Breeding
and Genetics, College of
Agriculture, OUAT,
Bhubaneswar, Odisha, India

SK Tripathy
Department of Agricultural
Biotechnology, College of
Agriculture, OUAT,
Bhubaneswar, Odisha, India

Correspondence

M Kabi
Department of Plant Breeding
and Genetics, College of
Agriculture, OUAT,
Bhubaneswar, Odisha, India

Phenotyping of sesame (*Sesamum indicum* L.) genotypes for powdery mildew resistance

M Kabi, B Baisakh, M Dash and SK Tripathy

Abstract

Present Investigation is conducted with thirty sesame genotypes for screening of powdery mildew disease. All the thirty genotypes were raised during Rabi season and infector row method was followed to obtained uniformity in disease reaction. After 45-60 DAS genotypes were scored for powdery mildew using 0-9 scale. Based on the PDI score, thirty genotypes were classified into Resistant (10), moderately resistant (13) and Susceptible (7) categories. From thirty genotypes, VRI-1 showed highly resistant reaction and Rama showed highly susceptible reaction. No genotypes found to be immune in response. Resistant genotypes can be utilized in breeding programme for development of resistant varieties and it can be utilized for identification of marker by crossing it with the susceptible genotype.

Keywords: Sesame, resistant, susceptible, PDI

Introduction

Sesame which is commonly known as queen of oilseed crop valuable for its high quality oil. This crop is having good inherent capacity to resist biotic and abiotic stress with the ability to grow well in drained soils and various agro climatic regions and is well adapted to different rotations. But sometimes it fails to cope with the adverse effect of environmental stresses. Among biotic stress, powdery mildew is a very devastating disease which causes loss upto 50% and is almost appear in all sesame growing area throughout the country. First report on incidence of powdery mildew in India by Patel *et al.* (1949) [8] and Mehta *et al.* (1951) [7]. Symptom of infection is first appears as small white patches on upper surface of leaves after 35DAS then spread all over the leaves. In case of severe infection lower area of leaves also affected by the spore of fungus. It is caused by many species of fungi, viz. *Erisiphe cichoreacearum* (Reddy and HariPriya, 1990) [12], *Erisiphe orontii* (Rajpurohit, 1993) [10], *Leveillula taurica* (Patel *et al.* 1949) [8], *Oidium erysiphoides* (Mehta, 1951; Roy, 1965) [7, 13], and *Oidium sesami* (Puzari *et al.*, 2006) [9]. In Odisha, it is mainly appear during Rabi season when temperature will fall below 25°C. The farmers of odisha generally taken it as a crop after harvesting of kharif paddy. As the disease is mostly affecting the leaf area in turn it reduces photosynthesis so also the yield. Chemical control of the disease incurs a very high cost of cultivation and also damage the environmental health. So it is necessary to look over for other way to escape the loss due to this disease. For this, development of resistance variety is the one and only choice to control the disease. Most of the resistance genes are residing in the wild species but transfer of such gene to the cultivated one is tedious process due to incompatibility of former with later. So selection of resistance genotypes from the cultivated germplasm is ultimate choice. In the present investigation all the efforts were made to select resistance genotypes and susceptible genotypes so that these can be utilized for development marker and resistance varieties.

Materials and Methods

The experimental material consists of 30 genotypes collected from different sources like Agricultural Research Station (JAU) Amreli, Gujrat (8), Tamil Nadu Agricultural University (2), Agricultural Research Station, Mandor, Rajstan (3), and AICRP, Sesame 17). The genotypes were screened during rabi season at EB-II section of OUAT. Infector row technique was followed to spread the disease. In addition to this susceptible check variety was also raised all around the plot to provide uniform disease inoculum for facilitating screening in field condition. Each of the genotype was sown in 3 rows is 3m length with 30X15 cm spacing and raised by following all recommended package and practices. Data for screening was recorded at 45-60 days after sowing. From each genotype five randomly plants are selected and from each plant 9 leaves were taken i.e. 3 from apical portion, 3 from middle portion and 3 from basal portion.

All 9 leaves are graded and scored by adopting 0-9 grade (TNAU, 1980) ^[15]. Level of resistance/susceptibility of the

genotype was calculated by percent of disease index (PDI) given by Mc Kinney (1923) ^[6].

Table 1: Grading of Powdery mildew disease intensity

Disease grade	Description
0	No lesions or specks
1	Small sized powdery specks infecting less than 1% leaf area
3	Enlarged irregular powdery growth covering 1-5% leaf area
5	Powdery growth to form big patches covering 5-25% leaf area
7	Powdery growth covering 25-50% leaf area followed by yellowing
9	100% leaf area covered with powdery growth, yellowing and dropping of infected leaves

$$\text{PDI} = \frac{\text{Sum of grades}}{\text{Total number of leaves analyzed} \times \text{maximum disease grade}} \times 100$$

Sum of grades is the sum of disease grade on nine leaves on which observation was recorded and maximum disease grade was nine in 0-9 scale (Table 2). On the basis of the PDI, the entries were grouped into four categories (Raja Ravindran, 1990).

Table 2: Classification of the entries based on Percent Disease Index (PDI)

PDI	Disease reaction
0	Immune (I)
1-30	Resistant (R)
31-50	Moderately resistant (MR)/tolerant (T)
>51	Susceptible (S)

Table 3: Reaction of 30 genotypes to powdery mildew disease

S. No.	Genotype	Percent Disease Incidence	Reaction
1	Amrit	45%	Moderately resistance
2	AT-345	23%	Resistance
3	AT-382	28%	Resistance
4	AT-393	55%	Susceptible
5	AT-394	57%	Susceptible
6	AT-400	22%	Resistance
7	AT-403	34%	Moderately resistance
8	AT-404	37%	Moderately resistance
9	BS-129	66%	Susceptible
10	C0-1	25%	Resistance
11	GT-10	20%	Resistance
12	JT-7	26%	Resistance
13	JT-12	56%	Susceptible
14	JT-14	54%	Susceptible
15	Kanak	27%	Resistance
16	Krishna	33%	Moderately resistance
17	Nirmala	39	Moderately resistance
18	OSM-22	41	Moderately resistance
19	PRACHI	28%	Resistance
20	RAMA	82%	Susceptible
21	RT-54	49%	Moderately resistance
22	RT-125	42%	Moderately resistance
23	RT-127	32%	Moderately resistance
24	RT-351	46%	Moderately resistance
25	Savitri	52%	Susceptible
26	Sekhar	35%	Moderately resistance
27	Smarak	48%	Moderately resistance
28	TKG-308	29%	Resistance
29	UMA	69%	Moderately resistance
30	VRI-1	5%	Resistance



Fig 1a: Resistant genotype (VRI-1) **Fig 1b:** Susceptible genotype (Rama)

Result and Discussion

A set of thirty genotypes were screened for powdery mildew using infector row technique. Out of thirty genotypes, ten genotypes were found to be resistance and PDI varies from 5%-29%. The most resistant genotype is VRI-1(5%) while other genotypes were having good level of resistance like AT-345(23%), AT-382(28%), AT-400(22%), CO-1(25%), GT-10(20%), JT-7(26%), Kanak (27%), Prachi (28%) and TKG-308(29%) (Table 3). A count of seven genotypes were found to be susceptible (PDI 52%-82%). and thirteen genotypes are found to be moderately resistance (PDI32%-49%). From the list of susceptible genotypes, a highly susceptible line (Rama) was screened which has PDI score 82% i.e. more than the PDI score of susceptible check variety Nirmala (68%). From the above observation it is cleared that incidence of diseases determined by the genotype. No genotype was found to be immune in reaction. The same result is also reported from the finding of Karunanithi *et al.* 1993; Rajpurohit, 1993; Karunanithi and Dinakaran, 1996 [3, 10, 4,]. But as per Hiremath, 1976; Suresh *et al.* 1991; Ganesh *et al.* 1992, Venkata Ramana Rao *et al.* 2011) [2, 14, 1, 16]. Few source of immune genotypes were reported in this crop. This contradictory difference in finding due to genotype taken for screening, screening technique adopted and difference in scaling of disease. It was also observed that duration of crop has a great influence in disease reaction which is strongly agree with the findings of Mallaiah *et al.* (2016) [5]. Reaction to disease reaction also influence by some agro-botanical trait like leaf breathiness and leaf angle. VRI-1 which show high degree of resistance to disease reaction is a narrow-leaved genotype whereas Rama which show susceptible reaction is a broad leaved genotype.

Conclusion

The present investigation concluded with the outcome that VR-I which is resistant genotype from ten resistant genotypes (AT-345, AT-382, AT-400, CO-1, GT-10, JT-7, Kanak, Prachi, TKG-308 and VRI-1) can used as parent in development of mapping population by crossing with highly susceptible variety Rama for identification of marker and development of resistant varieties for powdery mildew.

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