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Screening of sesame genotypes against powdery mildew disease caused by *Erysiphe cichorecearum*

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ABSTRACT

Powdery mildew disease of sesame occurs on epidemic scale in areas of high rainfall and humidity coupled with low night temperature causing considerable yield losses. Use of host plant resistance is the practical approach to manage this disease, but proper resistance sources with combining ability for the trait are unknown. Hence, an experiment was conducted to determine resistance in sesame genotypes against powdery mildew disease. Among the twenty four genotypes screened, none was found resistant while, nine genotypes exhibited moderately resistant to tolerant reaction and 15 genotypes exhibited susceptible reaction. Apparent rate of infection value varied and at times they did not remain consistent for given genotype and also did not show a particular trend which is attributed to genetic character of the genotype. The AUDPC values differed considerably for different genotypes. The values of AUDPC and apparent rate of infection of susceptible varieties were high as compared to moderately susceptible varieties. Genotype 'JLS-302-11' and 'JLT-7' having minimum AUDPC and apparent rate of infection value showed lowest intensity of powdery mildew while, genotype 'JLT-408' having maximum AUDPC and apparent rate of infection value showed highest intensity of powdery mildew.

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INTRODUCTION

Sesame (*Sesamum indicum* L.) commonly known as sesamum, til, gingelly is regarded as the 'Queen of Oilseeds', the quality of its oil being of high nutritional and therapeutic value. It is an ancient oilseed crop grown in India and perhaps the oldest oilseed crop in the world. Sesame is highly nutritive with medicinal value and has high oil (38-54%) and protein content (18-25%). Sesame seeds are digestive, anti-aging and rich in vitamin E, minerals like calcium (14.5 mg g^{-1}), phosphorus (570 mg g^{-1}), iron, copper, magnesium, zinc and potassium (Malik *et al.*, 2003). This unique composition coupled with high-

unsaturated fatty acid *viz*., linolinic and tocopherols make the sesame nearly perfect food. Sesame is inherently low yielding plant type. Its yield is further limited by various biotic and abiotic stresses. Sesame is known to suffer from number of fungal, bacterial and phytoplasmal diseases which cause huge reduction in its production.

The Major diseases of sesame occurring in India are powdery mildew, *Alternaria* leaf spot and phyllody (Rangaswamy, 1979). Among them, powdery mildew is a devastating disease in all the sesame growing states in general, Andhra Pradesh and Tamil Nadu in particular. It is caused by many species of fungi, *viz., Erysiphe cichorecearum*, *Erysiphe orontii, Sphaerothica fuliginea, Leveillula taurica, Oidium erysiphoides, Oidium sesami* and *Oidium* spp. It occurs on epidemic scale in areas of high rainfall and humidity coupled with low night temperature. In the initial stages greyish-white powdery growth appears on the upper surface of leaves. Further, several spots coalesce and the entire leaf surface gets covered with powdery coating. When the severity is high, the infection may be seen on the flowers and young capsules, leading to premature shedding. Sesame powdery mildew causes yield losses upto 25-50 per cent due to defoliation resulting in heavy reduction in total production (Rao *et al.*, 2013).

Powdery mildew disease is generally managed by foliar application of fungicides. The sterol biosynthesis inhibiting (triazole group) fungicides *viz.*, difenoconazole, hexaconazole and tebuconazole are effective in management of disease (Jagtap *et al.*, 2018). But, cultivation of genetically resistant crop against pathogen is the best management strategy because it is ideal, economical and environmentally safe. However, threat of resistance break down due to variation in pathogens always prevails. So it is very important to continue screening for sources of resistance against the disease and exploit the sources in breeding programme. When disease develops in epidemic form then resistant plants mostly escape the disease due to natural selection and create equilibrium between host and pathogen. Present study was designed to evaluate the response of sesame germplasm against powdery mildew disease under field conditions and identify the sources of resistance which can be further exploited in breeding programme for disease resistance.

MATERIAL AND METHODS

Seed of twenty four sesame genotypes comprising breeding lines, accessions and cultivated varieties were collected from Oilseed Research Station, Jalgaon (Maharashtra). A field trial was conducted in randomized block design in two replications during *Kharif* 2016 crop season at Agricultural Research Station, Niphad for screening the germplasm against powdery mildew disease. Each genotype was sown in 3.5 m length row with 45 x 10 cm spacing. Susceptible variety was sown after every five rows interval and was also placed around sides of field to ensure high and uniform level of powdery mildew infection. All the standard agronomical practices were followed, while no fungicidal spray was given throughout the cropping season.

Observation on the disease intensity on five randomly selected and tagged plants was recorded in each entry as per the disease scale given by Mayee and Datar (1986) at an interval of 10 days starting from 35 days after sowing (DAS). Further, these observations were converted to per cent disease intensity (PDI). On the basis of PDI, the entries were grouped into following four categories as described by Raja Ravindran (1990).

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

The rate of development of disease (r) at different intervals was calculated as per the formula given by Van der plank (1963), while area under disease progress curve (AUDPC) was calculated as per the formula given by Wilcoxson *et al.* (1975) using PDI obtained at 10 days intervals for each genotypes.

RESULTS AND DISCUSSION

Powdery mildew disease intensity on all the genotypes increased progressively with an increase in duration of the crop (Table 1). None of genotypes was found disease free at 35 DAS and the disease intensity ranged between 1.17 to 2.77 per cent. At 45 DAS, the disease intensity ranged from 3.10 to 6.97 per cent; while at 55 DAS, disease intensity was in the range of 9.22 to 20.20 per cent. Powdery mildew disease intensity increased with time and at 65 DAS, the disease intensity ranged between 21.47 to 42.93 per cent. Among the 24 genotypes, at 75 DAS, none of genotypes was found immune and resistant whereas, nine genotypes *viz.,* RT-373, TKG-503, TKG-478, RT-375, JLS-120, JLS-302-

11, JLS-408-2, GT-10 and JLT-7 exhibited moderately resistant to tolerant reaction while others exhibited susceptible reaction. The present investigation indicates that none of the entry was immune against powdery mildew suggesting lack of strong sources of resistance to the disease and these findings broadly agree with Dinakaran *et al*. (1989) who reported that no reliable source of resistance/immunity could be found in sesame crop against powdery mildew. A few have reported existence of resistant sources (Jahagirdar *et al.*, 2003, Nema and Duhoon, 2008).The contradictory observations may be due to differences in the disease scaling, screening techniques adopted, species and race spectrum.

Apparent rate of infection (r) on genotypes at different stages showed a wide variation (Table 2). The highest average "r" value was observed in the genotype JLT-408 (0.106) followed by TKG-22 (0.105) and JLS-708-2-1 (0.104) while, least in the genotype RT-373 (0.069). The maximum rate of spread was observed in genotype JLS-302-11 (0.104) at 35-45 days interval, GT-10 (0.128) at 45-55 days interval, JLT-408 (0.109) at 55-65 days interval and JLT-408 (0.098) at 65-75 days interval. Minimum rate of spread was observed in genotype RT-373 (0.090) at 35-45 days interval, JLT-7 (0.115) at 45-55 days interval, JLS-302-11 (0.091) at 55-65 days interval and JLS-302-11 (0.064) at 65-75 days interval. In the present investigation the average apparent rate of infection value varied and at times they did not remain consistent for given genotype and also did not show a particular trend which is attributed to genetic character of the genotype. Similar observations have been reported by Nagesha and Nargund (2005) in

Table 1: Reaction of sesame genotypes against powdery mildew under field condition

Sr. No.	Genotype	Per cent disease index (%)					AUDPC	Reaction/ response
		35 DAS	45 DAS	55DAS	65 DAS	75 DAS		
1.	JLS-606-7-2	2.11 (7.85)	5.45 (12.61)	16.03 (23.09)	34.53 (35.82)	54.44 (47.57)	843	S
2.	JLS-709-6-4	2.17 (7.96)	5.53 (12.70)	16.47 (23.43)	35.93 (36.66)	57.34 (49.30)	877	S
3.	TKG-506	2.29 (8.19)	5.91 (13.14)	17.34 (24.09)	37.33 (37.50)	58.80 (50.16)	911	S
4.	JLS-710-7-1	2.14 (7.90)	5.45 (12.61)	16.25 (23.26)	35.00 (36.10)	55.89(48.43)	857	S
5.	JLS-708-2-1	2.65 (8.82)	6.66 (13.98)	19.32 (25.54)	41.06(39.72)	63.88 (53.28)	1003	S
6.	MT-2013-3	2.02 (7.67)	5.07 (12.16)	14.71 (22.06)	31.26 (33.82)	52.26 (46.30)	782	S
7.	RT-373	1.32 (6.21)	3.48 (10.04)	10.32 (18.31)	22.86 (28.38)	40.65 (39.53)	577	MR/T
8.	TKG-503	1.80 (7.26	4.62 (11.59)	13.61 (21.17)	29.40 (32.65)	46.46 (42.92)	718	MR/T
9.	TKG-478	1.32 (6.21)	3.48 (10.04)	10.54 (18.51)	24.26 (29.32)	40.65 (39.53)	593	MR/T
10.	JLS-613-1	2.17 (7.96)	5.45 (12.61)	15.81 (22.93)	34.06 (35.53)	53.71 (47.15)	833	S
11.	JLS-301-24	2.20 (8.01)	5.60 (12.79)	16.47 (23.43)	35.46 (36.38)	55.17 (48.01)	862	S
12.	JLS-601-5-6	2.59 (8.70)	6.51 (13.82)	18.88 (25.23)	40.13(39.17)	62.43 (52.38)	980	S
13.	RT-375	1.74 (7.14)	4.47 (1139)	13.17 (20.81)	28.00 (31.76)	44.28 (41.65)	686	MR/T
14.	JLS-120	1.86 (7.38)	4.85 (11.88)	14.49 (21.88)	31.26 (33.82)	49.36 (44.60)	762	MR/T
15.	TKG-22	2.68 (8.87)	6.74 (14.07)	19.54 (25.70)	41.53 (39.99)	64.60 (53.74)	1014	S
16.	JLS-302-11	1.20 (5.91)	3.33 (9.81)	9.88 (17.90)	21.47 (27.42)	34.12 (35.64)	523	MR/T
17.	JLS-408-2	1.53 (6.68)	4.01 (10.78)	12.08 (19.88)	26.60(30.86)	41.37 (39.95)	641	MR/T
18.	GT-10	1.23 (6.00)	3.18 (9.59)	10.54 (18.51)	22.86(28.38)	36.29 (36.95)	553	MR/T
19.	PKVNT-11	2.08 (7.79)	5.22 (12.35)	15.15 (22.41)	32.20 (34.39)	50.09 (45.03)	787	S
20.	AT-324	1.86 (7.38)	4.85 (11.88)	14.49 (21.88)	31.73 (34.10)	50.81 (45.45)	774	S
21.	PT-1	2.14 (7.90)	5.60 (12.79)	16.47 (23.43)	35.46 (36.38)	56.62 (48.86)	869	S
22.	JLT-7	1.17 (5.83)	3.10 (9.47)	9.22 (17.27)	22.40 (28.06)	35.57 (36.51)	531	MR/T
23.	JLT-26	2.20 (8.01)	5.53 12.70)	16.03 (23.09)	34.06 (35.53)	52.99 (46.72)	832	S
24.	JLT-408	2.77 (9.01)	6.97 (14.31)	20.20 (26.16)	42.93 (40.82)	66.78(55.13)	1049	S
C.D. (P=0.05)		1.02	1.71	1.95	2.12	3.07		
S.E. ±		0.34	0.58	0.66	0.72	1.04		

Table 2: Apparent rate of infection of powdery mildew at various growth stages and computed values for AUDPC in sesame

Sr. No.	Genotype	Apparent rate of infection (r) per unit per day					AUDPC
		35-45 DAS	45-55 DAS	55-65 DAS	65-75 DAS	Average (r)	
1.	JLS-606-7-2	0.098	0.120	0.102	0.082	0.100	843
2.	JLS-709-6-4	0.097	0.121	0.104	0.087	0.103	877
3.	TKG-506	0.099	0.121	0.104	0.087	0.103	911
4.	JLS-710-7-1	0.097	0.121	0.102	0.085	0.101	857
5.	JLS-708-2-1	0.096	0.121	0.107	0.093	0.104	1003
6.	MT-2013-3	0.095	0.117	0.097	0.088	0.099	782
7.	RT-373	0.090	0.116	0.095	0.084	0.069	577
8.	TKG-503	0.097	0.118	0.097	0.073	0.096	718
9.	TKG-478	0.099	0.118	0.100	0.076	0.098	593
10.	JLS-613-1	0.096	0.118	0.101	0.081	0.099	833
11.	JLS-301-24	0.097	0.120	0.102	0.081	0.100	862
12.	JLS-601-5-6	0.096	0.121	0.106	0.091	0.103	980
13.	RT-375	0.097	0.118	0.094	0.071	0.095	686
14.	JLS-120	0.098	0.120	0.099	0.076	0.098	762
15.	TKG-22	0.096	0.121	0.107	0.094	0.105	1014
16.	JLS-302-11	0.104	0.116	0.091	0.064	0.094	523
17.	JLS-408-2	0.099	0.119	0.097	0.067	0.095	641
18.	GT-10	0.097	0.128	0.092	0.065	0.095	553
19.	PKVNT-11	0.095	0.117	0.098	0.075	0.096	787
20.	AT-324	0.098	0.120	0.101	0.080	0.100	774
21.	PT-1	0.100	0.120	0.102	0.086	0.102	869
22.	JLT-7	0.099	0.115	0.104	0.065	0.096	531
23.	JLT-26	0.096	0.118	0.099	0.078	0.098	832
24.	JLT-408	0.097	0.122	0.109	0.098	0.106	1049

sunflower and Wilcoxson *et al*. (1975) in wheat.

The AUDPC values differed considerably for different genotypes (Table 2). Minimum area under disease progress curve was observed in JLS-302-11 (523) followed by JLT-7 (531), GT-10 (553), RT-373 (577), TKG-478 (593), JLS-408-2 (641), RT-375 (686), TKG-503 (718), JLS-120 (762) with moderately resistant/ tolerant reaction. While, maximum area under disease progress curve with susceptible reaction was observed in JLT-408 (1049). Genotype JLS-302-11 and JLT-7 having minimum AUDPC and apparent rate of infection value showed lowest intensity of powdery mildew while, genotype JLT-408 having maximum AUDPC and apparent rate of infection value showed highest intensity of powdery mildew on sesame. The values of AUDPC and apparent rate of infection (r) of susceptible varieties were more as compared to moderately susceptible varieties. Similar results were also reported in wheat (Kapoor and Kumar,1996) and coriander (Singh and Rao, 2016).

REFERENCES

Dinakaran, D., Kandaswamy, G. and Thangavelu, S. (1989). Reaction of sesamum cultivars/varieties to *Oidium* sp. *Sesame and Safflower Newsletter.* **4**:45-47.

Jagtap, S.D., Game, B.C. and Waychal, G.U. (2018). Evaluation of foliar fungicides for management of powdery mildew disease of sesamum. *Internat. J. Agric. Innovat. & Res.,* **6**(4): 103-105.

Jahagirdar, S., Pawar, K.N., Ravikumar, M.R., Yenjerappa, S.T. and Prakash, B.G. (2003). Field evaluation of sesamum genotypes for multiple disease resistance. *Agril. Sci. Digest.,* **23**(1): 61-62.

Kapoor, A.S. and Kumar, J. (1996). Evaluation of slow mildewing resistance in pea. *Himanchal J. Agric. Res.,* **22**: 31–35.

Malik, M.A., Saleem, M.F., Cheema, M.A. and Ahmed, S. (2003). Influence of different nitrogen levels on productivity of sesame *(Sesamum indicum* L.) under varying planting patterns. *Int. J. Agriculture & Biology,* **5**(4): 490- 492.

Mayee, C.D. and Datar, V.V. (1986). Phytopathometry, Technical Bulletin-1 (Special Bulletin-3). Marathwada Agricultural University, Parbhani (M.S.) India, pp. 95.

Nagesha, G.K. and Nargund, V.B. (2005). Apparent rate of infection and area under disease progress curve: a measure of slow rusting in sunflower. *Karnataka J. Agric. Sci.,* **18**(1): 158-161.

Nema, S. and Duhoon, S.S. (2008). Field screening of extant vareties of sesame (*Sesamum indicum* L.) against powdery mildew disease. *J. Oilseeds Res*., **25**(1): 114-115.

Raja Ravindran, G. (1990). Genetics of powdery mildew resistance in sesame (*Sesamum indicum* L.). M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore (T.N.) India.

Rangaswamy, G. (1979). *Diseases of oilseeds: Diseases of crop plants in India.* Prentice- Hall of India private Limited, New Delhi, India, pp. 339-342.

Rao, P.V.R., Anuradha, G., Prasuna, K., Gouri Shankar, V. and Siddiq, E.A. (2013). Inheritance of powdery mildew resistance in Sesame (*Sesamum indicum* L.)- A review. *Int. J. Bio-resource and Stress Management*, **4**(4): 614-619.

Singh, A.K. and Rao, S.S. (2016). Evaluation of coriander germplasm for yield and powdery mildew resistance. *J. Spices & Aromatic Crops,* **25** (1) : 70-72.

Van der Plank, J.E. (1963). Plant diseases: Epidemics and Control. Academic press, New York, U.S.A., pp. 17-27.

Wilcoxson, R.D., Skovmand, B. and Atif, A.H. (1975). Evaluation of wheat cultivars for ability to retard development of stem rust. *Annals Applied Biology,* **80** (3): 275-281.