Original Research Article

Screening of sesame entries against Phyllody disease under field conditions

Abstract

Of all the sesame diseases, phyllody is one of the major ~~constraint~~constraints causing economical yield losses and initially it was considered to be caused by a virus but later resulted it was associated with phytoplasma presence. In the integrated management of phyllody disease of sesame, host plant resistance only plays a key role. Keeping this in view, a total of 137 entries including susceptible check YLM-66 (~~s~~Sarada) were screened under field conditions during *kharif*, 2021 to identify the resistance sources in the cultivars and for further exploitation in resistance breeding programme. Among which, none of the sesame entries were found immune or resistant to the disease. However, 10 entries (UTS-6, UTS-29, UTS-39, UTS-32, UTS-35, RMT-498, RMT-496, RT-430, NIC-10621-B and GT-10) were found moderately resistant with disease incidence ranged from 13.61-19.59 ~~%~~per cent, 52 ~~entries~~ showed tolerant reaction, 63 ~~entries~~ showed moderately susceptible reaction, 9~~nine entries~~ found susceptible and 2~~two entries~~ found highly susceptible disease reaction to phyllody disease and per cent disease incidence of 70.50% was recorded in susceptible check, YLM-66 at harvest.

Key words: Sesame, phyllody, ~~entries~~, check, disease incidence

Introduction

Sesame (*Sesamum indicum* L.) is an important oilseed crop cultivated in more than 55 countries of the world belong to the family of Pedaliaceae widely adapted to the areas with long growing seasons and well drained soils. Sesamum is primarily grown for its oil rich seeds with an oil content of 55 per cent in which seeds come in a variety of colours from cream white to charcoal black (Meena *et al.*, 2018). Oil has a long shelf life because of an antioxidant called sesamol and also contains oleic acid which is used in cooking, salads making and also as a raw material in the production of soaps, paints, varnishes, perfumes and in pharmaceuticals (Jin *et al.*, 2001-; Wang *et al.*, 2013). Among

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all the factors responsible for yield losses, diseases play an important role in which the crop is found to be affected by foliar diseases *viz.,Alternaria* leaf spots, powdery mildew; soil borne disease, foot and stem rot (charcoal rot) and phyllody caused by phytoplasma. Among all the diseases, phyllody is the major disease responsible for considerable yield losses accounting for 80% caused by the phytoplasma and spreads by insect vector, leaf hopper, *Orosius albicinctus* (Salehi and Izadpanah, 1992). Sesame phyllody was first time reported in Pakistan at Mirpur Khas in 1908 (Vasudeva and Sahambi, 1955; Vasudeva, 1961). Phytoplasmas are phloem inhabiting, wall less bacteria belong to the class of Mollicutes which cause devastating damage to crops and known to infect approximately 1000 plant species worldwide including cereals, legumes, vegetables, fruits and trees (Semuller *et al.*, 1998; Iftikhar and Fahmeed, 2011). Typical symptoms of phyllody include proliferation, floral virescence and accompanied with yellowing, cracking of seed capsule, germination of seeds within the capsules and formation of dark exudates on the foliage of the infected plants (Akhtar *et al*., 2009). The existing method of disease management includes destruction of weed reservoirs and use of systemic insecticides for vector control has been unsuccessful. However, the use of resistant genotypes is a ~~long term~~long-term solution to overcome this melady in sesamum. ~~Therefore~~Therefore, the current investigation was initiated to screen the sesame germplasms ~~entries~~ under field conditions and therefore to identify the ~~entries~~ resistant sources for the management of ~~to~~ phyllody disease.

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Materials and Methods

A f~~F~~ield experiment was conducted during *kharif*, 2021 at Agricultural Research Station, Utukur with a total of 137 entries (100 AICRP entries, 36 Utukur entries ~~and a check~~) including YLM-66 as susceptible check for their resistance against phyllody disease in the field under natural conditions (Table ~~No~~.1). Each test entry was sown in two replications in two rows of 4 m length with spacing of 30 cm between the rows and 10 cm in between the plants in a Randomized Complete Block Design (RCBD) by adopting all the recommended package of practices suggested by ANGRAU. Only conventional agronomic practices were followed to keep the crop in good condition; ~~however~~however, no plant protection measures were followed for vector control to have the high disease pressure of phyllody in the experimental field. Data on the incidence of the phyllody

disease was recorded at 40, 50, 60 ~~D~~days after sowing (DAS) of the crop and at harvest by counting the number of infected plants out of total plants and the percent disease incidence was calculated. Resistance or susceptibility of the test entries was categorized based on the average percentage of the plants infected by the phyllody disease following 0-6 disease rating scale as given by Mayee and Datar, 1986 (Table ~~No~~. 2).

Table No :1 - List of test entries

(AICRP, Sesamum)

DS-10	RMT 541	SI-2174-1	SI-118	RT-385	SI-1671	CUMS-17	JCS-2454	RMT-132
RMT 485	RMT 377	SI-780	SI-553	SI-2531-C	SI-3299	Madhavi	Chandana	RT-150
RMT 545	IS-1162 B	SI-269	IS 750-1-84	JCS-DT-26	SI-85	TBS-11	Rajeswari	RT-103
EC 370934	SI 7650	SI-772	EC-31045	NIC-10621-B	IS-684	VS-16-009	YLM-11	IC-205354
RMT 504	DS 54	SI-199-2-84	SI-1003	AT-413	IS-92-2	RT-388	YLM-17	IC-205258
RMT 544	DS 45	SI-42	SI-982	SI-770	SwethaTil	AT-437	Gowri	IC-205591
DS 35	JCS-DT-26	SI-44	RJS-29	JLS-1502-4	Hima	AT-382	RT-669	IC-205077
RMT 498	DS-56	SI-775	MT-31-07	DS-68	JCS-1020	DS-1846	RMT-215	IC-205306-1
DS 28	RT-430	SP-41	NIC-8600-A	SI-931	YLM-142	TBS-6	RT-68	RT-176
RMT 496	IS-101	NIC-8322	AT-409	JLS-708	YLM-146	TKG-22	RMT-221	RT-205321
AT 377	SI-1032	SI-17	JLS-706	VS-19-023	GT-10	DS-51	RMT-175	*S.radiatum*
S.alatum	YLM-66 (C)							

ARS, Utukur

UTS-10	UTS-8	UTS-204	UTS-16	UTS-25	UTS-35
UTS-7	UTS-9	UTS-2	UTS-17	UTS-26	UTS-36
UTS-21	UTS-29	UTS-3	UTS-19	UTS-28	UTS-37
UTS-39	UTS-6	UTS-12	UTS-22	UTS-31	UTS-38
UTS-32	UTS-11	UTS-14	UTS-23	UTS-33	UTS-208
UTS-1	UTS-20	UTS-15	UTS-24	UTS-34	UTS-211

Table ~~No~~.2 Disease Rating Scale for Phyllody disease incidence

Disease Rating	Percent infection	Reaction
0	No infection	Highly Resistant (HR)
1	0.1-10 % infection	Resistant (R)
2	10.1 – 20 % infection	Moderately Resistant (MR)
3	20.1 – 30 % infection	Tolerant (T)
4	30.1 – 40 % infection	Moderately Susceptible (MS)
5	40.1- 50 % infection	Susceptible (S)
6	> 50 % infection	Highly Susceptible (HS)

Results and Discussion

A ~~T~~total of ~~one hundred thirty seven~~137 entries (100 entries from AICRP, sesamum and 36 from ARS, Utukur and a susceptible check, YLM-66) were screened against phyllody under field conditions at Agricultural Research Station, Utukur and the phyllody infected plants were counted at 40, 50, 60 ~~days after sowing~~ DAS and at harvest of the crop and per cent incidence will be worked out and categorized based on the disease reaction as presented in the Table ~~No :~~ 3 to 6 ~~&~~and Plate 1.

Among the hundred AICRP entries screened for phyllody resistance under field conditions, incidence of phyllody ranged from 13.61 (RMT-498) to 52.63 (JCS-1020) per cent at harvest. None of the sesame entries were found ~~immune or~~ resistant to the disease. Entries *viz.*, RMT-498 (13.61%), RMT-496 (18.33%), RT-430 (17.95%), NIC-10621-B (19.59%) and GT-10 (18.46%) were found to be moderately resistant with disease incidence ranged from 10.1- 20~~%~~per cent. ~~Thirty two~~Thirty-two entries showed tolerant disease reaction with incidence ranged from 20.1- 30~~%~~per cent, fifty five entries showed moderately susceptible reaction with 30.1- 40~~%~~ per cent incidence, nine entries showed susceptible disease reaction with disease incidence range between 40.1-50~~%~~ per cent and two entries Swetha Til and JCS-1020 showed highly susceptible disease reaction with 52.03~~%~~per cent and 52.63 ~~%~~ per cent incidence respectively. Phyllody disease incidence of 70.50~~%~~per cent was recorded in susceptible check, YML-66 at harvest (Table ~~No.~~ 7).

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In ~~thirty six~~thirty-six Utukur entries screened for phyllody resistance under field conditions, none of the entries were found resistant to phyllody. Among the test entries, Phyllody disease incidence ranged from 15.09~~%~~ per cent (UTS-39) to 39.05~~%~~ per cent

(UTS-24). However, five entries *viz.*, UTS-39 (15.09%), UTS-32 (15.27%), UTS-29 (15.93%), UTS-6 (18.18%) and UTS-35(17.92%) showed moderately resistant reaction with disease incidence ranged from 10.1- 20% per cent. While, twenty entries were found to be tolerant with incidence ranged from 20.1- 30% per cent; Eight entries showed moderately susceptible reaction with 30.1-40% per cent incidence, none of the Utukur sesamum entries were found susceptible and highly susceptible to phyllody disease under field conditions in the current study (Table No. 7).

The development of cultivars with durable resistance to phyllody disease should be an integral component of sesame breeding programmes (Rajeswari *et al.*, 2010). Host Pplant Rresistance is one of the most important components of Integrated Disease Management. Breeding for disease resistance requires efficient, low cost and rapid screening techniques (Foolad *et al.*, 2000). The findings from the current study are in conformity with the results from the previous studies by other researchers with the work done in different countries using screening a varied number of germplasm lines, entries against unknown phytoplasmas (Shambharkar *et al.*, 1997; Selvanarayanan and Selvamuthukumaran, 2000; Singh *et al.*, 2007; Rajeswari *et al.*, 2010). Resistant genotypes developed infection at late stages and showed minor severity as disease was restricted at the top portion of the plants. Most of the entries screened in the current investigation showed a wide variation in the response of the phyllody disease under field conditions. The variable levels of disease incidence among the test entries may be because of the lack of a single factor or a combination of factors such as spatial and temporal variation in inoculum levels, environmental conditions, vector host preference, host resistance to vector, age of plants, soil conditions *etc* (Hoogstraten 1992; Akhtar *et al.*, 2010 & 2012). Several other workers had previously reported about the resistance sources against phyllody disease of sesamum. Palanna *et al.* (2015) reported GT-1 and DS-9 as resistant to phyllody and Manjunatha (2010) reported that IVT-09-1, IVT-09-2, IVT-09-14, IVT-09-19 and Kanakapura-1 (Local variety) showed resistant reaction. Mahadevaprasad *et al.*, 2017 screened 25 germplasm lines for the disease reaction to phyllody among which three genotypes *viz.*, KAU-05-2-12, PC-14-2 and Kanakapura local showed resistant reaction. Magar *et al.* (2022) investigated a total of 32 varieties of sesame which were screened under natural field conditions. Out of which, none of the entries were found immune to phyllody while seven entries *viz.*, TBS-05, TBS-09, TBS-02, Swetha, KMR-69, TKG-22 and Pragathi were found resistant.

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Out of 45 genotypes screened by Bevanur *et al*. (2024) during *kharif*, 2021 six genotypes (TKG-22, King-Karma-44, DSTA-A-1, IC-96113, IS-848-A, ES-3196 were found to be moderately resistant to phyllody disease.

Table ~~No.~~3 Reaction of Sesamum entries to phyllody disease under field conditions at 40 DAS

Per cent infection ~~(%)~~	No. of entries	List of entries
0 ~~%~~	55	UTS-7,32,10,9,29,6,3,22,24,25,26,28,33,35,37,38,208,211,DS-10, RMT-545, EC 370934, DS-35, DS-28, RMT-496, AT 317, RMT 541, DT-26,56, NIC 8600 A, JLS-706, SI-2531-C, JCS-DT-26, SI- 770, JLS-1502-4, JLS-708, SI-1671, SI-3299, SwethaTil, Hima, JCS-1020, YLM-146, CUMS-17, DS-1846, JCS-2454, Chandana, Rajeswari, YLM-17, RT-175, RT-103, IC-205354, IC-205591, *S.radiatum*
0.1 – 10 ~~%~~	81	UTS-21,39,1,8,11,20,204,2,14,16,19,23,31, 34, 36, RMT-485, RMT-504, RMT-544, RMT-498, RMT-377, IS-1162-B, SI-7650, DS-54,DS-45, RT-430, IS-101, SI-1032, SI-2174-1, SI-780, SI-269, SI-772, SI-199-2-84. SI-42,44,775, SP-41, NIC-8322, SI-17, SI-118, 553, IS-750-1-84, EC-31045, SI-1003, 982, RTS-29, MT-31-07, NIC-8600-A, AT-409, RT-385, NIC-10621-B, AT-413, DS-68, SI-931, VS-19-023, SI-85, IS-684, IS-92-2, YLM-142, GT-10, Madhavi, TBS-11, VS-16-009, RT-388, AT-437, AT-382, TKG-22, YLM-11, Gowri, RT-669, RMT-215, RT-68, RMT-221, RT-150, 176 , IC-205258, 205077, RT-205321
10.1 - 20 ~~%~~	01	YLM-66
20.1 - 30 ~~%~~	-	Nil
30.1 - 40 ~~%~~	-	Nil
40.1 -50 ~~%~~	-	Nil
>50 ~~%~~	-	Nil
No germination in *S.alatum*		

Table ~~No.~~4 Reaction of Sesamum entries to phyllody disease under field conditions at 50 DAS

Per cent infection ~~(%)~~	No. of entries	List of entries
0 ~~%~~	01	***S.radiatum***
0.1 – 10 ~~%~~	40	UTS-32,9,2,19, 2, 19, 22, 23, 24, 25, 26, 33, 35, 36, 37, 208, 211, DS-10, DS-35, RMT 498, DS-28, RMT-377, IS-1162-B, DS-54, 45, DT-26, DS-56, SI-772, SI-42, NIC-8322, SI-118, JLS-706, RT-385, JCS-DT-26, JLS-1502-4, JLS-708, SI-3299, GT-10IC-205354, IC-205591, RT-176
10.1 – 20 ~~%~~	63	UTS-10,7,21,29,14,15,16,17, 28, 31, 34, 38, RMT-485, 545, EC-370934, RMT-504, 544, RMT, 496, AT-377, RMT-541, SI-7650, RT-430, IS-101, SI-1032, SI-2174-1, SI-269, SI-199-2-84, SI-44, SP-41, SI-17, SI-553, IS-750-1-84, EC-31045, SI-1003, 982, RJS-29, MT-31-07, AT-409, SI-2531-C, AT-413, DS-68, VS-19-023, SI-1671, SI-85, IS-684, Swetha, Hima, JCS-1020, YLM-146, GT-10, CUMS-17, Madhavi, TBS-11, VS-16-009, AT-437, DS-1846, DS-51, YLM-11, 17, Gowri, RMT-215, RT-68, RMT-221, RT-175, 132, IC-205591,205077, 205306-1
20.1 – 30 ~~%~~	19	UTS-39, 11, 20, SI-780, SI-775, NIC-8600-A, SI-770, YLM-142, AT-382, TBS-6, TKG-22, JCS-2454, Chandana, Rajeswari, RT-669, RT-150, 103, RT-176, RT-205321
30.1 - 40 ~~%~~	03	IS-92-2, AT-382, YLM-66

40.1 – 50 %	--	Nil
>50 %	--	Nil
No germination in *S.alatum*		

Table No.5 Reaction of Sesamum entries to phyllody disease under field conditions at 60 DAS

Per cent infection (%)	No. of entries	List of entries
0 %	01	***S.radiatum***
0.1 – 10 %	01	RMT-498
10.1 – 20 %	36	UTS-7,39,32,9,29, 20,204, 15,17, 26,28,31,35,36,37,208, 211, RMT-485, DS-28, RMT- 496, RMT-377, RT-430, SI-2174-1, SI-269, SI-772, SI-199-2-84, SI-42, SP-41, SI-17, EC-31045, JLS-706, SI-3229, GT-10, Gowri, IC-205354, IC-205591
20.1 – 30 %	66	UTS-21, 1, 8, 11, 2,3,12, 14, 16, 19, 22, 33,34, DS-10, RMT-545, EC-370934, RMT-544, DS-35, AT-377, DMT-541, IS-1162-B, SI-7650, DS-54, DT-26, DS-56, IS-101, SI-780, SI-44, SI-775, NIC-8322, SI-118, 553, IS-750-1-84, SI-1003, SI-982, RTS-29, AT-409, SI-2531-C, JCS-DT-26, NIC-10621-B, AT-413, SI-770, JLS-1520-4, SI-931, JLS-708, VS-19-023, SI-1671, VS-16-009, RT-388, DS-1846, JCS-2454, Chandana, Rajeswari, YLM-11, 17, RMT-215, RT-68, RMT-221, RT-175, RT-103
30.1 - 40 %	27	UTS-23, 24, 25, RMT-204, DS-45, SI-1032, MT-31-07, NIC-8600-A, SI-85, IS-684, Hima, YLM-142, 146, CUMS-17, Madhavi, TBS-11, AT-437, AT-382, TKG-22, DS-51, RT-669, RT-132, RT-150, IC-205258, IC-205077, RT-176, RT-205321
40.1 – 50 %	05	IS-92-2, SwethaTil, JCS-1020,TBS-6, IC-205306-1
>50 %	01	YLM-66
No germination in *S.alatum*		

Table No.6 Reaction of Sesamum entries to phyllody disease under field conditions at harvest

Per cent infection (%)	No. of entries	List of entries
0 %	--	--
0.1 – 10 %	--	Nil
10.1 – 20 %	10	UTS-39, 32, 29, 6, 35, RMT-498, RMT, 496, RT-430, NIC-10621-B, GT-10
20.1 – 30 %	52	UTS-7, 21, 1, 8, 11, 20, 204, 2, 3, 14,,15, 16, 19, 26, 28, 34, 36, 37, 208, 211, RMT-485, 545, 544, DS-28, RMT-377, DS-54, DS-56, SI-2174-1, SI-269, SI-772, SI-199-2-84, SI-42, SI-44, SP-41, NIC-8322, SI-17, 118, EC-31045, JLS-706, JCS-DT-26, JLS-1502-4, SI-931, JLS-708, SI-3299, VS-16-009, DS-1846, JCS-2454, Chandana ,RT-68, IC-205354, Gowri, *S.radiatum*
30.1 - 40 %	63	UTS-10, 3, 12, 22, 23, 24, 25, 38, DS-10, EC-370934, RMT-504, DS-35, AT-377, RMT-541, IS-1162-B, SI-7650DS-45, DT-26, IS-101, SI-1032, SI-780, SI-775,553, IS-750-1-84, SI-1003, SI-982, RJS-29, MT-31-07, NIC-8600-A, AT-409, SI-2531-C, SI-770, SI-1671, SI-85, Hima, YLM-142, 146, CUMS-17, Madhavi, TBS-11, RT-388, AT-

		437, 382, DS-51, Rajeswari, YLM-11,17, RT-669, RMT-215, RMT-221, RT-175, RT-150, RT-103, IC-205591, IC-205077, RT-176, RT-205321
40.1 – 50 %	09	RT-385, VS-19-023, IS-684, IS-92-2, TBS-6, TKG-22, RT-132, IC-205258, IC-205306-1,
>50 %	03	SwethaTil, JCS-1020, YLM-66
No germination in *S.alatum*		

Table No.7 Per cent Disease incidence (%) of phyllody at 40, 50, 60 DAS and at Harvest

Sl.No	Entry	Phyllody Disease Incidence (%)				Disease Reaction
		At 40 DAS	At 50 DAS	At 60 DAS	At harvest	
ARS, Utukur entries						
1.	UTS-10	0.00	17.61	33.53	38.69	**MS**
2.	UTS-7	0.00	17.05	14.61	21.40	**T**
3.	UTS-21	0.925	13.91	21.59	26.54	**T**
4.	UTS-39	0.830	21.83	10.19	15.09	**MR**
5.	UTS-32	0.00	8.94	10.81	15.27	**MR**
6.	UTS-1	1.020	17.94	27.97	29.84	**T**
7.	UTS-8	0.00	16.53	21.19	26.42	**T**
8.	UTS-9	0.00	9.53	19.02	23.67	**T**
9.	UTS-29	0.00	9.53	11.17	15.93	**MR**
10.	UTS-6	0.00	12.63	12.63	18.18	**MR**
11.	UTS-11	4.08	23.81	27.81	28.80	**T**
12.	UTS-20	4.00	21.35	17.91	20.93	**T**
13.	UTS-204	1.08	18.36	18.92	22.77	**T**
14.	UTS-2	1.42	6.86	20.34	23.28	**T**
15.	UTS-3	0.00	14.40	27.98	32.06	**MS**
16.	UTS-12	0.79	19.72	23.08	30.35	**MS**
17.	UTS-14	2.00	11.20	20.37	25.09	**T**
18.	UTS-15	1.16	1.16	18.13	21.57	**T**
19.	UTS-16	2.01	14.20	20.14	26.34	**T**
20.	UTS-17	0.98	10.78	14.37	20.30	**T**
21.	UTS-19	2.04	6.00	20.41	28.43	**T**
22.	UTS-22	0.00	8.77	20.95	31.66	**MS**
23.	UTS-23	2.12	9.57	30.35	33.70	**MS**
24.	UTS-24	0.00	7.89	35.15	39.05	**MS**
25.	UTS-25	0.00	6.57	37.00	35.00	**MS**
26.	UTS-26	0.00	8.53	18.12	24.55	**T**
27.	UTS-28	0.00	14.46	17.58	24.99	**T**
28.	UTS-31	1.21	17.34	18.45	21.45	**T**
29.	UTS-33	0.00	8.82	21.61	24.54	**T**
30.	UTS-34	3.63	11.83	20.39	20.39	**T**
31.	UTS-35	0.00	4.00	14.895	17.92	**MR**
32.	UTS-36	1.815	6.36	11.860	23.09	**T**
33.	UTS-37	0.00	8.00	18.105	21.81	**T**

34.	UTS-38	0.00	11.95	30.31	34.88	**MS**
35.	UTS-208	0.00	7.50	14.76	21.52	**T**
36.	UTS-211	0.00	3.445	17.81	23.37	**T**
AICRP, Sesamum entries						
37	DS-10	0.00	6.57	28.50	34.82	**MS**
38	RMT 485	1.160	11.62	18.13	24.69	**T**
39	RMT 545	0.00	10.20	23.05	26.12	**T**
40	EC 370934	0.00	13.09	25.46	30.53	**MS**
41	RMT 504	1.515	13.41	34.23	34.81	**MS**
42	RMT 544	1.190	10.78	23.09	26.60	**T**
43	DS 35	0.00	4.83	22.84	37.14	**MS**
44	RMT 498	1.215	7.95	4.61	13.61	**MR**
45	DS 28	0.00	4.90	18.05	25.31	**T**
46	RMT 496	0.00	16.66	13.73	18.33	**MR**
47	AT 377	0.00	18.05	24.26	30.48	**MS**
48	RMT 541	0.00	11.09	22.64	32.50	**MS**
49	RMT 377	1.110	7.77	18.14	22.65	**T**
50	IS-1162 B	1.92	8.64	22.87	33.92	**MS**
51	SI 7650	0.845	12.78	25.41	31.05	**MS**
52	DS 54	1.060	6.38	21.36	24.03	**T**
53	DS 45	2.00	6.00	31.52	33.33	**MS**
54	JCS-DT-26	0.00	2.22	22.05	31.61	**MS**
55	DS-56	0.00	5.65	23.58	28.13	**T**
56	RT-430	4.30	13.32	12.28	17.95	**MR**
57	IS-101	1.69	16.34	23.49	36.70	**MS**
58	SI-1032	0.925	14.44	32.22	33.90	**MS**
59	SI-2174-1	1.960	18.62	16.41	21.56	**T**
60	SI-780	2.880	23.25	29.68	35.35	**MS**
61	SI-269	2.195	11.95	17.35	20.24	**T**
62	SI-772	0.925	4.62	19.93	21.11	**T**
63	SI-199-2-84	1.02	10.20	19.50	23.16	**T**
64	SI-42	3.75	9.00	14.14	22.46	**T**
65	SI-44	2.08	11.00	20.29	26.54	**T**
66	SI-775	3.40	20.41	28.02	32.00	**MS**
67	SP-41	2.88	11.53	15.72	20.72	**T**
68	NIC-8322	4.34	9.78	22.95	26.01	**T**
69	SI-17	2.94	10.78	16.96	23.41	**T**
70	SI-118	1.04	6.24	23.56	29.73	**T**
71	SI-553	2.17	16.30	28.71	34.19	**MS**
72	IS 750-1-84	4.80	17.65	29.60	32.22	**MS**
73	EC-31045	2.12	13.00	18.80	25.71	**T**
74	SI-1003	2.72	10.01	21.77	30.87	**MS**
75	SI-982	2.88	17.95	24.95	30.13	**MS**
76	RJS-29	0.96	19.66	27.91	33.28	**MS**
77	MT-31-07	0.87	18.67	30.94	35.60	**MS**
78	NIC-8600-A	0.00	20.79	32.08	38.30	**MS**
79	AT-409	2.17	12.23	24.83	30.10	**MS**
80	JLS-706	0.00	7.89	16.28	22.45	**T**
81	RT-385	1.215	9.42	33.30	45.37	**S**
82	SI-2531-C	0.0	15.19	29.90	35.59	**MS**
83	JCS-DT-26	0.0	6.96	26.15	29.67	**T**
84	NIC-10621-B	2.70	20.17	20.20	19.59	**MR**
85	AT-413	3.26	12.57	27.75	34.91	**MS**

86	SI-770	0.00	20.06	29.22	30.61	**MS**
87	JLS-1502-4	0.00	3.145	21.71	21.73	**T**
88	DS-68	0.96	11.215	42.95	44.17	**S**
89	SI-931	2.67	16.475	26.56	27.90	**T**
90	JLS-708	0.00	7.550	20.15	22.93	**T**
91	VS-19-023	0.94	10.805	27.56	40.50	**S**
92	SI-1671	0.00	14.915	22.52	34.47	**MS**
93	SI-3299	0.00	9.46	19.67	28.25	**T**
94	SI-85	1.85	19.48	31.46	36.11	**MS**
95	IS-684	1.00	16.20	33.68	40.34	**S**
96	IS-92-2	0.90	30.45	44.84	46.59	**S**
97	SwethaTil	0.00	17.01	47.24	52.03	**HS**
98	Hima	0.00	14.96	30.10	37.07	**MS**
99	JCS-1020	0.00	18.98	48.03	52.63	**HS**
100	YLM-142	0.87	25.94	30.51	34.20	**MS**
101	YLM-146	0.00	10.21	34.99	36.78	**MS**
102	GT-10	0.96	8.72	11.93	18.46	**MR**
103	CUMS-17	0.00	12.72	35.17	36.48	**MS**
104	Madhavi	0.81	13.69	35.78	39.84	**MS**
105	TBS-11	1.78	17.33	30.71	36.07	**MS**
106	VS-16-009	1.02	11.01	25.55	27.21	**T**
107	RT-388	2.70	30.42	25.83	30.62	**MS**
108	AT-437	1.11	10.39	36.36	38.56	**MS**
109	AT-382	0.98	20.58	32.35	32.89	**MS**
110	DS-1846	0.00	10.57	27.43	28.71	**T**
111	TBS-6	0.00	20.85	40.60	48.24	**S**
112	TKG-22	1.040	21.22	31.38	41.66	**S**
113	DS-51	0.00	12.29	31.10	34.81	**MS**
114	JCS-2454	0.00	25.97	21.90	23.32	**T**
115	Chandana	0.00	27.25	29.89	29.89	**T**
116	Rajeswari	0.00	21.88	27.69	35.00	**MS**
117	YLM-11	0.81	15.17	27.64	32.19	**MS**
118	YLM-17	0.00	18.12	29.10	32.76	**MS**
119	Gowri	0.84	17.46	15.66	28.75	**T**
120	RT-669	1.78	23.05	33.22	38.57	**MS**
121	RMT-215	1.63	18.93	27.30	36.08	**MS**
122	RT-68	1.72	16.84	25.25	29.00	**T**
123	RMT-221	0.94	12.13	28.17	35.13	**MS**
124	RMT-175	0.00	15.73	29.68	33.92	**MS**
125	RMT-132	2.88	14.97	33.75	47.50	**S**
126	RT-150	2.04	11.79	33.78	39.18	**MS**
127	RT-103	0.00	25.45	29.40	33.82	**MS**
128	IC-205354	0.00	9.73	17.29	22.37	**T**
129	IC-205258	1.69	26.5	39.39	45.45	**S**
130	IC-205591	1.78	13.98	19.35	31.53	**MS**
131	IC-205077	1.85	13.62	35.68	39.86	**MS**
132	IC-205306-1	3.84	19.22	44.67	49.99	**S**
133	RT-176	3.38	23.44	34.15	38.96	**MS**
134	RT-205321	1.78	23.66	30.03	32.73	**MS**
135	*S.radiatum*	--	--	--	--	--
136	*S.alatum*	--	--	--	--	--
137	YLM-66 (C)	16.08	37.73	64.80	70.50	**HS**

Commented [NK7]: 2 digits after point is enough

Commented [NK8]: Work out SEm and CD

Plate 1 Screening of the sesamum test entries against Phyllody disease under field conditions during *Kharif*, 2021

Commented [NK9]: One plate is enough

Conclusion

In conclusion, our study confirmed that out of 136 screened under field conditions during *kharif*, 2021 ten entries viz., (UTS-6, UTS-29, UTS-39, UTS-32, UTS-35, RMT-498, RMT-496, RT-430, NIC-10621-B and GT-10) were found moderately resistant to sesamum phyllody. These entries may be promoted after confirming the disease resistance by screening for further two seasons and therefore successfully to be utilized in the sesame breeding programme.

References

1. Akhtar, K.P., Sarwar, G., Abbas, G., Asghar, M.J., Sarwar, N and Hameed, M. 2012. Mungbean phyllody disease in Pakistan: its symptomatology, transmission, varietal response

and effect on morphology and yield traits of mungbean plants. *International Journal of Pest Management*. 58: 139-145.

2. Akhtar, K.P., Sarwar, G., Dickinson, M., Ahmad, M., Haq, M.A., Hameed, S and Iqbal, M.J. 2009. Sesame phyllody disease: Symptomatology, etiology and transmission in Pakistan. *Turkish Journal of Agricultural Forestry*. 33: 477-486.
3. Akhtar, K.P., Saleem, M.Y., Asghar, M., Ahmad, M and Sarwar, N. 2010. Resistance of Solanum species to Cucumber mosaic virus subgroup IA and its vector *Myzus persicae*. *European Journal of Plant Pathology*. 128: 435-450.
4. Bevanur, A., Jayalakshmi, S.K., Bharath, M., Manthesha, H.D., Savitha, A.S., Shreedevi, S Chavan and Suvarna. 2024. Screening of sesame germplasm against major foliar diseases. *International Journal of Advanced Biochemistry Research*. 8 (4): 710-714.
5. Foolad, M.R., Ntahimpera, N., Christ, B.J and Lin, G.Y. Comparison of field, greenhouse and detached leaflet evaluations of tomato germplasm for early blight resistance. *Plant Disease.* 2000. 84: 967-972.
6. Hoogstraten, L. 1992. New TYLCV tolerant tomato varieties from Royal Sluis. Tomato Leaf Curl Newsletter. 2: 1.
7. Iftikhar, S and F. Fahmeed. 2011. Detection of phytoplasma from diseases potato sample. *Pakistan Journal of Botany*. 43: 1799 – 1800.
8. Jin, U.H., Lee, J.W., Chung, Y.S., Lee, J.H., YI, Y.B., Kim, Y.K., Hyung, N.I., Pyee, J.H and Chung, C.H. 2001. Characterization and temporal expression of a w-6 fatty acid desaturate CDNA from sesame (*Sesamum indicum* L.) seeds. *Plant Sciences*. 161: 935 – 941.
9. Magar, S.J., Markad, H.N and Somwanshi, S.D. 2022. Evaluation of different genotypes, varieties and hybrids against sesame phyllody disease. *The Pharma Innovation*. 11 (3) : 2187-2189.
10. Manjunatha, N. 2010. Molecular detection and characterization of sesame phyllody phytoplasma. M.Sc. (Agri.) Thesis, Univ. Agri. Sciences, Bengaluru, India, 12 pp.
11. Mayee, C.D and Datar, V.V. 1986. *Phytopathometry*. Tech. bull. Matathwada Agric. Univ., Parbhani, 218pp.
12. Mahadevaprasad, T.N., Karuna, K., Jayashree, M.K and Srinivas Reddy, M.K. Field evaluation of sesame lines against phyllody. *Electronic Journal of Plant Breeding*. 8 : 945-949.
13. Meena, B., Indiragandhi, P and Ushakumari, R. 2018. Screening of Sesame (Sesamum indicumL.) germplasm against major diseases. *Journal of Pharmacognosy and Phytochemistry.* SP1: 1466-1468.
14. Natarajan, S., Sachidanathan, K and Rao, S.M. 1983. Screening of sesame cultures for resistance to powdery mildew under field conditions. In: proceedings of the national seminar on management of disease of oilseed crops. Madurai, India. 71pp.

15. Palanna, K.B., Shivanna, B., Boraiah, B., Anil Pappachan and Nagaraj, M.S. 2015. Evaluation and screening of sesame varieties against sesamum phyllody and its incidence and severity in Central dry zone of Karnataka. Green Farming. 6 (5) : 1130-1133.
16. Rajeswari, S., Thiruvengadam, V., Ramaswamy, N.M. 2010. Production of interspecific hybrids between *Sesamum alatum* Thonn and *Sesamum indicum* L., through ovule culture and screening for phyllody disease resistance. *South African Journal of Botany*. 76: 252-258.
17. Salehi, M and Izadpanah, K. 1992. Etiology and transmission of sesame phyllody in *Iran Journal of Phytopathology*. 135: 37- 47.
18. Seemuller, E., Marcone, C., Lauer, U., Ragozzino, A and Goschl, M. 1998. Current status of molecular classification of the phytoplasmas. *Journal of Plant Pathology*. 21: 18-25.
19. Selvanarayanan, V and Selvamuthukumaran, T. 2000. Field resistance of sesame cultivars against phyllody disease transmitted by *Orosius albicinctus* Distant. Sesame and Safflower Newsletter. 12: 82-85.
20. Singh, P.K., Akram, M., Vajpeyi, M., Srivastava, R.L., Kumar, K and Naresh, R. 2007. Screening and development of resistant sesame varieties against phytoplasma. *Bulletin of Insectology*. 60: 303-304.
21. Vasudeva, R.S. 1961. Diseases of Sesamum. In "SESAMUM" Edited by A.B. Joshi. Publication Indian Council of Agricultural Research. New Delhi, India. 92-107.
22. Vasudeva, R.S. and Sahambi, H.S. 1955. Phyllody in Sesamum (*Sesamum orientale* L.,). *Indian Phytopathology*. 8: 124-129.
23. Wang, L., Zhang, Y., Li, P., Zhang, W., Wang, X., Qi, X and Zhang, X. 2013. Variation of sesamin and sesmolin contents in sesame cultivars from china. *Paksitan Journal of Botany*. 45 (1): 177-182.
24. Santha Lakshmi Prasad, M., Surya Prakash Reddy, M., Duraimurugan, P., Prasindhu, K., Jawaharlal, J., Ramya, K.T., Kumaraswamy, H.H., Sujatha, M., Alivelu, K., Sakthivel, K and Boopathi, T. 2024. Identification of resistance sources for sesame phyllody under epiphytotic conditions in India. *Genetic Resources and Crop Evolution*.