Original Research Article

New Germplasms for Resistant Sources against Turcicum Leaf Blight Disease in Maize (*Zea mays* L.)

ABSTRACT

The present studies were aimed to evaluate 490 maize entries for resistance against turcicum leaf blight (TLB) disease in randomized block design using a check at Agricultural Research Station, Karimnagar, Telangana State, India during *rabi* (November,2021 to Febrauary,2022) and *kharif* (July,2022 to October,2022). Out of 213 lines during *rabi* 2021−2022,16 promising entries viz.,KML-21,KML-24,KML-33,KMH-388,KMH-275,KMH-373,KMH-478,KMH-370,KMH-257,KMH-393,KMH-340,KMH-131,KMH-41,KMH-36, SAMRAT and KMH- 64 were identified as resistant,157 lines were recorded as moderately resistant, 38 lines were recorded as moderately susceptible and CM-202 entry was recorded 80.42 per cent disease index (PDI).Out of 277 lines during *kharif* 2022,3 lines viz.,KMH-804,KMH-751 and KML-86 were identified as resistant lines to turcicum leaf blight disease,132 lines were moderately resistant,one line CM-202 was noticed with high 81.42 per cent disease index and severely affected by turcicum leaf blight and rated as susceptible during *kharif*, 2022.

Keywords: Screening, germplasms, resistant, turcicum leaf blight disease, maize.

1. INTRODUCTION

Maize (*Zea mays* L.,) is a staple food crop in many partsof the World. Maize is monocotyledonous plant that belongs to grass family (Poaceae). Maize (*Zea mays* L.) is the most versatile crop adapted to different agro-ecological and climatic conditions. Maize the third most importantcereal crops in the world's agricultural economy. Maize had highest genetic yield potential and is commonly called as queen ofcereals. One of the main deterrents to high grain yield in maize is its susceptibility to several diseases (1). It is the third most important cereal crop nextto rice and wheat in India. It is one of the potential cropof Telangana State which has come up on large areas indifferent districts under rain fed areas and under irrigated command areas of Karimnagar, Nizambad, Siddipeta, Warangal, Khammam, Bhadradi kottagudemamu and Kamareddy etc. Maize is being affected by many diseases. Diseases in maize are decreasing the yield from 28% to 91%.Maize has a notable productive potential among thecereals.

In India, Maize is grown in an area of 10.04 million hectares with a production of 333.62 million tonnes and productivity of 3349kg/ha or 3.349 t/ha. In Telangana state, maize occupies an area of 0.41 million hectares with a production of 2.13 million tonnes and productivity of 5178 Kg/ha (2). Out of which,0.12 lakh hectares was the Maize area in Karimnagar (erstwhile) district.

For existing biotic and abiotic stresses, the sustainability of the maize production to meet the future demand is debatable. Maizeis affected by more than sixty diseases. Sixteen are major diseases among them. Maize is attacked by many diseases in *kharif* and *rabi* seasons causing severe reduction in yield. Among all the foliar diseases which are affecting the maize, Turcicum leaf blight caused by *Exserohilum turcicum* (syn.*Heliminthosporium turcicum* Pass.), is considered a serious disease where climatic conditions are cool with high relative humidity. Maize grain yield loss varies from 25% to 90% in different parts of India depending upon the severity of turcicum leaf blight epiphytotics (3 and 4). Yield losses are about 50% when the disease is severe at 2−3 weeks after pollination (5). Turcicum leaf blight is considered a serious disease under agro ecologies of Telangana. Turcicumleaf blight affects the maize crop from the seedling stage to maturity. The symptoms first appear as grayish green small elliptical spots on the leaves with water soaked lesionsparallel to leaf margins and finally attain a spindle shape withlong elliptical grayish or tan lesions. If the disease starts at anearly stage, it causes the premature death of blighted leaves. As a result, the crop losses its nutritive value as fodder, have reduced germination capacity, vigor, grain yield and total sugar content (6), has restricted starch formation, chaffy kernels and infected plants are liable to infection with stalk rots (7).

Genetic resistance of crop plants against pathogen is economical and eco-friendly disease management strategy. The resistant varieties are not only environmental friendly but also suitable to adopt at farmers level. There is a need to identify new sources of resistance through artificial epiphytotics to cater the resistance breeding programs. The objective of this study was to assess the maize inbred lines and their hybrids for resistance to turcicum leaf blight disease under field conditions. Keeping in view the above points, the present study was carried out to screen the four hundred and ninety maize entries for identification of resistant sources against turcicum leaf blight disease.

~~1.~~ 2. MATERIALS AND METHODS

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Evaluated 490 maize entries for resistance against turcicum leaf blight (TLB) disease in Telangana State. The

diseased leaf samples of affected maize plants showing typical symptoms of turcicum leaf blight having necrotic lesions were collected in paper poly bags from different maize growing areas of Research station, Karimnagar and Telangana districts.The Agricultural Research Station, Karimnagar is situated at 18^{o} 30'N latitude, 79^{o} 15'E longitude and 259.15 m above mean sea level. Two hundred thirteen entries for *rabi* season 2021−2022 and two hundred seventy six entries for *kharif* season 2022. The pathogen *Exserohilum turcicum* was isolated from infected leaves using single spore isolation technique (8).

Layout of maize trial for field screening

For the identification of source of resistance to *Exserohilum turcicum*, a set of four hundred and ninety maize entries were evaluated in a randomized block design (RBD) alongwith a check CM-202 at Agricultural Research Station, Karimnagar field conditions using 1 to 9 disease rating scale(9) . The test genotypes were planted in 2 rows of 3m length each with a plant spacing of 60×20 cm^2.

Inoculum preparation and inoculation

Spore suspension of the *Exserohilum turcicum* from twenty days old cultures was prepared by washing the conidia with distilled water. Equal volume of spore suspension was mixedand sprayed in evening hours by using atomizer at three to four leaf stages of maize plants and humidity was maintained by spraying water. Check plants were also treated similarly with spore suspension.

Disease reaction was recorded by using 1 to 9 scale (9 and 10) at 35 to 45 days after inoculation and assessed per cent disease index (PDI) of TLB disease.The genotypes showing disease score /scale from 1.0 to 3.0 were considered as resistant (R), 4−5 as moderately resistant (MR), 6−7 as moderately susceptible (MS) and 8-9 as susceptible (S) (Table 1).

Table 1: Rating scale for maize turcicum leaf blight disease (9 and 10).

Disease scale	Per cent diseased leaf area	Per cent Disease Index (PDI)
1.0	Nil to very slight infection (≤10%).	11.11
2.0	Slight infection, a few lesions scattered on two lower leaves (10.1-20%)	22.22
3.0	Light infection, moderate number of lesions scattered on four lower leaves (20.1-30%).	33.33
4.0	Light infection, moderate number of lesions scattered on lower leaves, a few lesions scattered on middle leaves below the cob (30.1-40%).	44.44
5.0	Moderate infection, abundant number of lesions scattered on lower leaves, moderate number of lesions scattered on middle leaves below the cob (40.1-50%).	55.55
6.0	Heavy infection, abundant number of lesions scattered on lower leaves, moderate infection on middle leaves and a few lesions on two leaves above the cob (50.1-60%)	66.66
7.0	Heavy infection, abundant number of lesions scattered on lower and middle leaves and moderate number of lesions on two to four leaves above the cob (60.1-70%).	77.77
8.0	Very heavy infection, lesions abundant scattered on lower and middle leaves and spreading up to the flag leaf (70.1-80%).	88.88
9.0	Very heavy infection, lesions abundant scattered on almost all the leaves, plant prematurely dried and killed (>80%).	99.99

~~1.~~ 3. RESULTS AND DISCUSSION

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Disease score of maize entries to turcicum leaf blight disease and artificially inoculated under field conditions during *rabi* 2021−2022 and *kharif* 2022 was observed. The performance of 490 germplasms along with susceptible check on the basis of disease reaction and 1-9disease scale was classified into four groups (Table 2 and 3).

Disease reaction during *rabi* 2021-2022

Out of the two hundred and thirteen entries, one entry KMH-388 was identified with disease score 2, 15 entries viz.,KML-21,KML-24,KML-33 ,KMH-275,KMH- 373 , KMH- 478 , KMH-370,KMH-257,KMH-393 ,KMH- 340 , KMH- 131 , KMH-41 , KMH-36, SAMRAT and KMH- 64 with a score 3. Entries with disease scores 1, 2 and 3 were categorizedas resistant. The PDI for KMH-388 was 21.83. Eighty two entries with disease score 4 (33.34 to 44.44 PDI) and Seventy five entries with disease score 5 (44.45 to 55.55 PDI) are moderately resistant. Thirty eight lines were moderately susceptible with a disease score 6 and 7. CM-202 recorded 80.42 per cent disease

index, severely affected by turcicum leaf blight and rated as susceptible (Table 2).

Disease reaction during *kharif*-2022

277 genotypes were screened against turcicum leaf blight disease. Out of them, three genotypes viz., KMH-804, KMH-751 and KM-86 were identified as disease score 3, which were categorized as resistant. Thirty lines viz., KMH-875, KMH-917, KMH-918, KMH-26, KMH-18, KMH-915, KMH-40, KMH-788, KMH-813, KMH-722, KMH-854, KMH-815, KMH-761, KMH-731, KMH-726,KMH-904,S-6668,NMH-4144,KNMH-4191,SAMARTH,KML-5,KML-21,KML-24,KML-57,KML-65,KML-70,KML-74,KML-76, KML-83, PFSR-3 and KML-87 with disease score 4 and one hundred and one lines with disease score 5 were moderately resistant. One hundred and thirty lines were moderately susceptible with a disease scores 6 and 7. In CM-202, the per cent disease index was 81.42, which was also severely affected by turcicum leaf blight and rated as susceptible (Table 3).

Similar results were reported by scientists: (11) reported that inbred NAI-147 and composite Girija expressed reisitance to Turcicum leaf blight. (12) identified twenty inbred lines as sources of resistance against Turcicum leaf blight of maize. (13) Screened the temperate maize lines against northern corn leaf blight and found five inbreds resistant to disease. (14) identified 56 moderately resistant genotypes and two inbreds (NAI-125, NAI-137) showed moderate resistant reaction. (15) carried out a disease reaction studies against turcicum leaf blight with two crosses viz., 15C (A) x I-318 (R) and I-401(A)×I-318(R) for all six generations with P1, P2, F1, F2, BC1 and BC2 . Results revealed that significant variability has been exhibited by fungus to infect different generations of a particular cross. In I-15C (A) × I-318(R) cross, F1 was moderately resistant to turcicum leaf blight but F1 of I-401(A)×I-318(R) cross was moderately susceptible to the disease. (9) results revealed that the variety BH660 was highly resistant withthe incidence of 13.7% and variety BH543 was susceptible with the incidence of 52.3%. (16) results showed that out of 26 maize genotypes, 8 genotypes viz., PS 39, CML 451, CML 470, CML 472, VL1030, VL 1018140, VL1018527 and SMI178-1 were found resistant and eight genotypes viz., PS45, CML165, CML459, VL1249, VL0536, SMC-5, SMC-3 and KDL211 were found moderately resistant against *E. turcicum* with disease grade ranged from 2.1−2.5. (17) tested one hundred inbred lines each of early maturing (EM) and extra-early maturing (EEM) against TLB disease and recorded average disease severity values ranging from 1.9−5.8 and 2.9−5.7 for the EM and EEM inbred lines respectively. (18) screened 135 genotypes. Out of them, 34 genotypes expressed moderately resistant reaction, 73 showed moderately susceptible reaction and 29 genotypes exhibited susceptibility reaction to TLB disease. (19) recorded per cent disease severity in two inbred lines, viz., NAI-112 and NAI-147 and one hybrid, HQPM-1 was found to be resistant to turcicum leaf blight disease. (20) evaluated twenty sixmaize hybrids along with check hybrids against turcicum leaf blig disease resistance and two hybrids viz., AH4158 and AH4142 were found to be resistant to turcicum leaf blight disease . (21) evaluated 237 entries. Out of them, 41 inbred lines were found resistant (disease incidence <3.0), 181 inbred lines were moderately resistant (disease incidence 3.1−5.0) and 15 inbred lines were moderately susceptible (disease incidence 5.1−7.0).

CONCLUSION

During *rabi* 2021−2022, one entry KMH-388 was resistant ,15 promising entries viz., KML-21,KML-24,KML-33 ,KMH-275 , KMH- 373 , KMH- 478 , KMH-370 , KMH-257 , KMH-393 , KMH- 340 , KMH- 131 , KMH-41 , KMH-36, SAMRAT and KMH- 64 were identified as resistant with disease score 3 and CM-202 (check) entry was recorded 80.42 per cent disease index (PDI) out of 213 lines .

In *kharif* 2022, 3 lines viz.,KMH-804, KMH-751 and KML-86 were identified as resistant lines to turcicum leaf blight disease (score 3), remaining recorded disease score from 4−8 and one line CM-202 (check) was noticed with high 81.42 per cent disease index and severely affected by turcicum leaf blight disease and rated as susceptible out of 277 lines. Breeders have to use these identified resistant lines in crossing program to develop high yield turcicum leaf blight disease resistant hybrids.

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Table:2 : Per cent disease index of different maize germplasms to turcicum leaf blight (TLB) *rabi*- 2021-2022

Sl no.	Germplasms	Per cent disease index of TLB (Mean value)	Score	Reaction
1	KML-1	53.33	5	MR
2	KML-2	39.99	4	MR
3	JCY-2-7	34.44	4	MR
4	KML-4	48.88	5	MR
5	KML-6	41.11	4	MR
6	KML-7	35.55	4	MR
7	KML-8	44.44	4	MR
8	KML-9	72.21	7	MS
9	KML-10	51.10	5	MR
10	KML-11	53.35	5	MR
11	KML-13	56.16	6	MS
12	KML-14	52.21	5	MR
13	KML-15	35.55	4	MR
14	KML-17	43.33	4	MR
15	KML-21	24.44	3	R
16	KML-22	56.65	6	MS
17	KML-24	33.33	3	R
18	KML-25	35.55	4	MR
19	KML-26	43.32	4	MR
20	KML-28	65.55	6	MS
21	KML-29	48.88	5	MR
22	KML-31	62.20	6	MS
23	KML-32	54.42	5	MR
24	KML-33	27.77	3	R
25	KML-70	35.35	4	MR
26	KML-71	62.21	6	MS
27	KML-72	60.00	6	MS
28	KML-74	44.43	4	MR
29	KML-75	34.44	4	MR
30	KML-76	43.33	4	MR
31	KML-77	59.99	6	MS
32	KML-78	39.99	4	MR
33	KML-79	38.88	5	MR
34	KML-80	34.44	4	MR
35	KML-81	57.77	6	MS
36	KML-82	45.55	5	MR
37	KML-83	54.44	5	MR
38	KML-85	46.66	5	MR
39	KML-86	41.49	4	MR
40	KML-87	43.33	4	MR
41	KML-88	43.33	4	MR
42	KML-18	43.32	4	MR
43	KML-19	44.42	4	MR
44	KML-30	47.77	5	MR
45	KML-66	54.44	5	MR
46	KML-6	61.11	6	MS
47	KML-225	42.22	4	MR
48	PFSR-3	39.99	4	MR

49	KML-69	53.33	5	MR
50	KML-16	40.00	4	MR
Slno	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
51	KNMH-4211	44.34	4	MR
52	KNMH-4181	57.77	6	MS
53	KNMH-4191	51.10	5	MR
54	KNMH-4192	61.11	6	MS
55	KNMH-141	48.88	5	MR
56	KNMH-131	48.88	5	MR
57	KMH-396	51.10	5	MR
58	KMH-393	43.32	4	MR
59	KMH-793	37.77	4	MR
60	KMH-770	43.33	4	MR
61	KMH-275	29.99	3	R
62	KMH-400	34.44	4	MR
63	KMH-242	56.66	6	MS
64	KMH-247	52.22	5	MR
65	KMH-240	40.95	4	MR
66	KMH-246	49.99	5	MR
67	KMH-394	46.65	6	MS
68	KMH-498	44.44	4	MR
69	KMH-489	34.44	4	MR
70	KMH-506	39.72	4	MR
71	KMH-496	40.80	4	MR
72	KMH-493	45.55	5	MR
73	KMH-388	21.83	2	R
74	KMH-387	34.44	4	MR
75	KMH-403	36.66	4	MR
76	KMH-373	31.11	3	R
77	KMH-501	33.27	3	R
78	KMH-500	51.10	5	MR
79	KMH-499	43.33	4	MR
80	KMH-505	55.55	5	MR
81	KMH-276	53.33	5	MR
82	KMH-271	46.66	5	MR
83	KMH-286	43.33	4	MR
84	KMH-275	55.55	5	MR
85	KMH-281	63.32	6	MS
86	KMH-318	66.66	6	MS
87	KMH-322	54.44	5	MR
88	K8322	59.95	6	MS
89	P3546	58.88	6	MS
90	NK6240	45.55	5	MR
91	GK3128	46.66	5	MR
92	PAC751	48.35	5	MR
93	LG-3603	49.99	5	MR
94	S-6668	42.10	4	MR
95	K-50	64.44	6	MS
96	KMH-253	57.77	6	MS
97	KMH-262	50.00	5	MR
98	KMH-258	38.88	4	MR
99	KMH-268	44.44	4	MR
100	KMH-256	56.66	6	MS
101	KMH-415	53.33	5	MR
102	KMH-414	57.77	5	MR
103	KMH-307	43.32	4	MR
104	KMH-308	63.65	6	MS

105	KMH-311	41.41	4	MR
106	KMH-314	39.77	4	MR
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
107	KMH-306	44.22	4	MR
108	KMH-245	38.64	4	MR
109	KMH-235	46.66	5	MR
110	KMH-238	46.66	5	MR
111	KMH-237	48.88	5	MR
112	KMH-236	42.22	4	MR
113	KMH-243	55.35	5	MR
114	KMH-242	40.88	4	MR
115	KMH-18	41.10	4	MR
116	KMH-20	46.66	5	MR
117	KMH-777	49.99	5	MR
118	KMH-762	51.11	5	MR
119	KMH-768	58.88	6	MS
120	KMH-433	47.44	5	MR
121	KMH-431	53.32	5	MR
122	KMH-25	55.55	5	MR
123	KMH-336	59.99	6	MS
124	KMH-335	62.21	6	MS
125	KMH-340	31.00	3	R
126	KMH-343	54.44	5	MR
127	KMH-341	45.53	5	MR
128	KMH-332	42.21	4	MR
129	KMH-331	44.44	4	MR
130	KMH-337	34.44	4	MR
131	KMH-339	44.44	4	MR
132	KMH-471	47.77	5	MR
133	KMH-470	44.44	4	MR
134	KMH-469	35.55	4	MR
135	KMH-586	45.55	5	MR
136	KMH-472	57.77	6	MS
137	KMH-363	49.99	5	MR
138	KMH-357	52.00	5	MR
139	KMH-358	60.77	6	MS
140	KMH-367	46.45	5	MR
141	KMH-359	37.77	4	MR
142	KMH-482	58.88	6	MS
143	KMH-542	59.99	6	MS
144	KMH-544	48.88	5	MR
145	KMH-543	46.66	5	MR
146	KMH-919	41.10	4	MR
147	KMH-131	28.88	3	R
148	KMH-128	38.88	4	MR
149	KMH-916	39.99	4	MR
150	KMH-249	39.95	4	MR
151	KMH-266	39.77	4	MR
152	KMH-407	39.99	4	MR
153	KMH-479	44.34	4	MR
154	KMH-480	58.80	6	MS
155	KMH-459	62.22	6	MS
156	KMH-478	27.99	3	R
157	KMH-475	37.95	4	MR
158	KMH-483	41.10	4	MR
159	KMH-457	57.17	6	MS
160	KMH-370	24.38	3	R

161	KMH-367	45.55	5	MR
162	KMH-369	48.88	5	MR
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
163	KMH-363	46.66	5	MR
164	KMH-382	36.55	4	MR
165	KMH-408	57.77	6	MS
166	KMH-588	57.77	6	MS
167	KMH-466	34.44	4	MR
168	KMH-467	37.77	4	MR
169	KMH-257	31.88	3	R
170	KMH-385	49.99	5	MR
171	KMH-106	53.33	5	MR
172	KMH-107	52.22	5	MR
173	KMH-367	44.44	4	MR
174	KMH-393	33.33	3	R
175	KMH-400	36.66	4	MR
176	KMH-377	47.75	5	MR
177	KMH-365	46.66	5	MR
178	KMH-364	49.99	5	MR
179	KMH-420	38.88	4	MR
180	KMH-387	39.99	4	MR
181	KMH-151	54.22	5	MR
182	KMH-327	48.88	5	MR
183	KMH-388	34.44	4	MR
184	KMH-574	55.55	5	MR
185	KMH-573	42.20	4	MR
186	KMH-392	34.44	4	MR
187	KMH-456	43.33	4	MR
188	KMH-450	46.66	5	MR
189	KMH-449	57.77	6	MS
190	KMH-461	49.99	5	MR
191	KMH-458	44.44	4	MR
192	KMH-457	42.21	4	MR
193	KMH-460	35.55	4	MR
194	KMH-459	36.77	4	MR
195	KMH-41	25.55	3	R
196	KMH-36	33.32	3	R
197	KMH-545	61.11	6	MS
198	KMH-540	48.85	5	MR
199	KMH-546	37.77	4	MR
200	KMH-194	39.78	4	MR
201	KMH-77	38.88	4	MR
202	KMH-64	29.99	3	R
203	KMH-565	42.32	4	MR
204	DHM-121	46.66	5	MR
205	SAMRATH	32.22	3	R
206	HT-5402	63.33	6	MS
207	P-3401	48.88	5	MR
208	NK-6514	48.88	5	MR
209	DHM-117	65.35	6	MS
210	BIO-9544	53.33	5	MR
211	HT5106	55.25	5	MR
213	NK6802	47.77	5	MR
	CM-202 (Check)	80.42	8	S

Table 3: Per cent disease index of different maize entries to turcicum leaf blight (TLB) *kharif*-2022

Slno.	Hybrids	Per cent disease index of TLB (Mean value)	Score	Reaction
1	KMH-886	58.99	6	MS
2	KMH-890	57.77	6	MS
3	KMH-881	63.33	6	MS
4	KMH-882	61.66	6	MS
5	KMH-885	52.21	5	MR
6	KMH-868	72.22	7	MS
7	KMH-871	67.77	7	MS
8	KMH-867	63.33	6	MS
9	KMH-869	56.66	6	MS
10	KMH-872	63.64	6	MS
11	KMH-876	58.88	6	MS
12	KMH-875	35.55	4	MR
13	KMH-127	86.66	8	S
14	KMH-610	47.77	5	MR
15	KMH-917	44.44	4	MR
16	KMH-924	53.33	5	MR
17	KMH-918	34.44	4	MR
18	KMH-26	44.44	4	MR
19	KMH-18	42.22	4	MR
20	KMH-921	52.21	5	MR
21	KMH-922	42.21	4	MR
22	KMH-915	42.21	4	MR
23	KMH-916	53.32	5	MR
24	KMH-926	68.88	7	MS
25	KMH-111	63.22	6	MS
26	KMH-138	58.88	6	MS
27	KMH-125	47.77	5	MR
28	KMH-107	53.33	5	MR
29	KMH-136	82.66	8	S

30	KMH-132	64.44	6	MS
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
31	KMH-109	47.77	5	MR
32	KMH-139	63.33	6	MS
33	KMH-152	46.66	5	MR
34	KMH-169	71.10	7	MS
35	KMH-935	46.66	5	MR
36	KMH-40	42.22	4	MR
37	KMH-22	51.10	5	MR
38	KMH-94	53.33	5	MR
39	KMH-91	46.66	5	MR
40	KMH-69	72.22	7	MS
41	KMH-842	74.44	7	MS
42	KMH-156	65.55	6	MS
43	KMH-101	48.88	5	MR
44	KMH-839	58.88	6	MS
45	KMH-163	61.11	6	MS
46	KMH-766	62.22	6	MS
47	KMH-151	61.10	6	MS
48	KMH-160	64.44	6	MS
49	KMH-157	74.44	7	MS
50	KMH-162	74.44	7	MS
51	KMH-71	55.55	5	MR
52	KMH-161	58.88	6	MS
53	KMH-843	74.44	7	MS
54	KMH-195	61.10	6	MS
55	KMH-767	62.22	6	MS
56	KMH-773	48.88	5	MR
57	KMH-102	63.33	6	MS
58	KMH-743	58.88	6	MS
59	KMH-775	63.33	6	MS
60	KMH-769	60.00	6	MS
61	KMH-846	58.88	6	MS

62	KMH-838	56.66	6	MS
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
63	KMH-766	61.10	6	MS
64	KMH-103	58.88	6	MS
65	KMH-765	62.21	6	MS
66	KMH-789	56.66	6	MS
67	KMH-786	51.11	5	MR
68	KMH-819	68.88	6	MS
69	KMH-823	53.32	5	MR
70	KMH-788	36.66	4	MR
71	KMH-78	54.33	5	MR
72	KMH-131	63.33	6	MS
73	KMH-813	41.10	4	MR
74	KMH-68	51.10	5	MR
75	KMH-782	48.88	5	MR
76	KMH-811	59.99	6	MS
77	KMH-73	80.00	8	S
78	KMH-62	63.33	6	MS
79	KMH-124	63.33	6	MS
80	KMH-98	53.33	5	MR
81	KMH-794	71.11	7	MS
82	KMH-814	71.10	7	MS
83	KMH-856	55.55	5	MR
84	KMH-77	45.55	5	MR
85	KMH-865	48.88	5	MR
86	KMH-816	65.55	6	MS
87	KMH-742	60.00	6	MS
88	KMH-780	66.66	6	MS
89	KMH-812	66.66	6	MS
90	KMH-907	63.33	6	MS
91	KMH-805	52.22	5	MR
92	KMH-804	32.22	3	R
93	KMH-58	79.99	8	S

94	KMH-796	69.99	7	MS
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
95	KMH-55	51.10	5	MR
96	KMH-902	59.99	6	MS
97	KMH-722	42.22	4	MR
98	KMH-806	64.44	6	MS
99	KMH-809	68.88	7	MS
100	KMH-799	75.55	7	MS
101	KMH-67	57.77	6	MS
102	KMH-854	38.88	4	MR
103	KMH-862	56.66	6	MS
104	KMH-800	54.44	5	MR
105	KMH-56	59.99	6	MS
106	KMH-798	52.22	5	MR
107	KMH-808	46.88	5	MR
108	KMH-802	80.00	8	S
109	KMH-901	54.44	5	MR
110	KMH-905	54.44	5	MR
111	KMH-815	42.22	4	MR
112	KMH-858	52.21	5	MR
113	KMH-76	59.99	6	MS
114	KMH-783	52.22	5	MR
115	KMH-863	85.55	8	S
116	KMH-866	49.99	5	MR
117	KMH-855	58.88	6	MS
118	KMH-57	59.99	6	MS
119	KMH-859	59.99	6	MS
120	KMH-795	54.44	5	MR
121	KMH-793	51.10	5	MR
122	KMH-752	74.44	7	MS
123	KMH-787	53.33	5	MR
124	KMH-753	86.66	8	S
125	KMH-746	57.77	6	MS

126	KMH-754	47.79	5	MR
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
127	KMH-755	77.77	7	MS
128	KMH-756	73.33	7	MS
129	KMH-757	68.88	7	MS
130	KMH-747	61.10	6	MS
131	KMH-758	82.22	8	S
132	KMH-759	65.55	6	MS
133	KMH-760	45.55	5	MR
134	KMH-750	71.10	7	MS
135	KMH-748	71.10	7	MS
136	KMH-763	48.88	5	MR
137	KMH-745	57.77	6	MS
138	KMH-744	48.88	5	MR
139	KMH-761	42.22	5	MR
140	KMH-749	65.55	6	MS
141	KMH-751	23.33	3	R
142	KMH-725	56.66	6	MS
143	KMH-722	49.99	5	MR
144	KMH-729	62.22	6	MS
145	KMH-730	78.88	7	MS
146	KMH-723	59.99	6	MS
147	KMH-731	41.10	4	MR
148	KMH-732	46.66	5	MR
149	KMH-733	52.22	5	MR
150	KMH-734	51.10	5	MR
151	KMH-726	44.44	4	MR
152	KMH-728	46.66	5	MR
153	KMH-741	48.88	5	MR
154	KMH-163	58.88	6	MS
155	KMH-740	54.44	5	MR
156	KMH-739	49.99	5	MR
157	KMH-738	68.88	7	MS

158	KMH-737	55.55	5	MR
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
159	KMH-904	44.44	4	MR
160	KMH-724	54.44	5	MR
161	KMH-735	56.66	6	MS
162	KMH-742	51.10	5	MR
163	KMH-736	54.44	5	MR
164	S-6668	43.33	4	MR
165	PAC-751	52.22	5	MR
166	NK-30	54.44	5	MR
167	B-9144	63.33	6	MS
168	NK-6802	59.99	6	MS
169	DKC-9198	49.99	5	MR
170	DKC-9173	54.44	5	MR
171	P-3302	55.55	5	MR
172	P-3401	51.11	5	MR
173	NK-6240	54.44	5	MR
174	K-EKKA	71.11	7	MS
175	IQ-8319	76.66	7	MS
176	IQ-8220	56.66	6	MS
177	8227-C	51.11	5	MR
178	Bond-(NMH-007)	53.33	5	MR
179	NMH-1258	51.10	5	MR
180	NMH-4144	44.44	4	MR
181	K NMH-131	66.66	6	MS
182	KNMH-141	68.88	7	MS
183	KNMH-4191	40.00	4	MR
184	NK-6514	60.00	6	MS
185	B-8135	51.10	5	MR
186	B-9544	47.74	5	MR
187	SAMARTH	35.55	4	MR
188	PAC-751 elite	63.33	6	MS
189	K-50	56.66	6	MS

190	HT-5109	49.99	5	MR
Slno.	**Hybrids**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
191	HT-5402	58.88	6	MS
192	DKC-7074	64.44	6	MS
193	DHM-182	49.99	5	MR
194	DHM-117	56.60	6	MS
195	DHM-121	54.44	5	MR
196	PAC-741	79.99	8	S
Slno.	**Germplasms**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
1	KML-1	58.88	6	MS
2	KML-2	83.33	8	S
3	KML-4	63.33	6	MS
4	KML-5	38.88	4	MR
5	KML-6	57.77	6	MS
6	KML-7	60.00	6	MS
7	KML-8	56.66	6	MS
8	KML-9	49.99	5	MR
9	KML-10	53.33	5	MR
10	KML-11	61.11	6	MS
11	KML-12	63.33	6	MS
12	KML-13	60.00	6	MS
13	KML-14	63.33	6	MS
14	KML-15	47.77	5	MR
15	KML-16	48.88	5	MR
16	KML-17	64.44	6	MS
17	KML-19	76.66	7	MS
18	KML-20	55.55	5	MR
19	KML-21	38.88	4	MR
20	KML-22	53.33	5	MR
21	KML-24	44.44	4	MR
22	KML-25	47.77	5	MR
23	KML-26	49.99	5	MR
24	KML-27	73.33	7	MS

25	KML-28	53.33	5	MR
Slno.	**Germplasms**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
26	KML-29	51.10	5	MR
27	KML-30	48.88	5	MR
28	KML-31	69.98	6	MS
29	KML-32	56.77	6	MS
30	KML-33	51.10	5	MR
31	KML-34	59.99	6	MS
32	KML-36	69.99	7	MS
33	KML-37	58.88	6	MS
34	KML-41	60.00	6	MS
35	KML-43	61.11	6	MS
36	KML-44	53.33	5	MR
37	KML-45	57.77	6	MS
38	KML-46	60.00	6	MS
39	KML-47	62.22	6	MS
40	KML-48	61.11	6	MS
41	KML-49	53.33	5	MR
42	KML-50	62.22	6	MS
43	KML-51	53.33	5	MR
44	KML-52	60.00	6	MS
45	KML-53	64.44	6	MS
46	KML-54	53.33	5	MR
47	KML-55	56.66	6	MS
48	KML-56	74.44	7	MS
49	KML-57	37.77	4	MR
50	KML-58	54.44	5	MR
51	KML-59	57.77	6	MS
52	KML-60	63.33	6	MS
53	KML-61	52.21	5	MR
54	KML-62	49.99	5	MR
55	KML-63	46.66	5	MR
56	KML-64	51.10	5	MR

57	KML-65	34.44	4	MR
Slno.	**Germplasms**	**Per cent disease index of TLB (Mean value)**	**Score**	**Reaction**
58	KML-66	59.99	6	MS
59	KML-67	54.44	5	MR
60	KML-69	46.66	5	MR
61	KML-70	44.44	4	MR
62	KML-71	55.55	5	MR
63	KML-72	46.66	5	MR
64	KML-73	52.21	5	MR
65	KML-74	42.22	4	MR
66	KML-75	55.55	5	MR
67	KML-76	44.44	4	MR
68	KML-77	45.55	5	MR
69	KML-78	57.77	6	MS
70	KML-79	54.66	5	MR
71	KML-80	52.22	5	MR
72	KML-81	58.88	6	MS
73	KML-82	57.77	6	MS
74	KML-83	40.00	4	MR
75	KML-85	53.33	5	MR
76	KML-86	23.10	3	R
77	KML-87	44.44	4	MR
78	KML-88	61.10	6	MS
79	KML-225	65.55	6	MS
80	PFSR-3	42.21	4	MR
	CM-202(Check)	81.42	8	S