



## Research Article

# Reaction of QPM inbred lines against Maydish Leaf Blight (MLB) and Charcol Rot

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### Abstract

Seventeen newly developed QPM inbred lines were screened against Maydish Leaf Blight and Charcol rot at two locations. Inbreds DQL 2015 and DQL 2071 were found as resistant for MLB and moderately resistant to charcoal rot. These lines can also be used in disease resistance breeding programme after the confirmation of resistance in one or more seasons.

### Keywords:

Maize, resistance, maydish leaf blight, charcol rot

### Introduction:

Maize (*Zea mays* L; 2n=20) is an important cereal crop of the world. It is called *queen of cereals*. In India it is grown annually in an area of 8.5 mha producing 21 million tones with average productivity of 2.5 t/ha during 2011-12. It is being used as feed (63 per cent), food (23 per cent), starch industries (12 per cent), seed and miscellaneous use (2 per cent) in India. The main problem of human nutrition and livestock feed in developed countries is insufficient production and poor quality of cereal proteins. Maize proteins in livestock feed are very important since they precipitate upto 80 % in the diet. However due to very low content of essential amino acids i.e., lysine and tryptophan in grain endosperm, biological value is very low, which is main limiting factor of common maize in feeding of monogastric animals including human beings. Therefore, development and production of new Quality Protein Maize (QPM) inbreds and hybrids is essential for improvement of the nutritional quality of daily diet (Bressani, 1975). Maize is affected by as many as 112 diseases on a global basis and out of these 35 has been reported from India. The loss in terms of harvested grain by different diseases per annum has been determined to be in the order of 13.2 per cent, amounting to 1459.6 million rupees (Sharma and Lal, 1998). The impact of diseases results not only in lower yields but also reduces the value and quality of the grain and may increase cost of cultivation. The disease spectrum varies in different agro-climatic zones but the more serious diseases are leaf blight, downy mildew, stalk rot and rust. However, QPM is very sensitive to various diseases like maydish leaf blight, turcicum leaf blight, post flowering stalk rot, charcoal rot, etc. Hence, QPM germplasm need to be screened against different diseases for

development of resistant/ tolerant hybrids. In the present investigation, QPM inbred lines were screened against May dish Leaf Blight (MLB) and Charcol rot (CR) in a Multiloation trial to identify resistant/ tolerant inbreds for development of hybrids with multiple resistance.

### Material and methods

Seventeen newly developed QPM inbred lines were sown in single row plot of 3 m length in two sets at Ludhiana and Karnal for MLB and Delhi and Ludhiana for Charcol rot during Kharif 2013. Susceptible checks were planted after every 10<sup>th</sup> row and on both sides of plot to create epiphytotic conditions. In case of MLB, irrigation channel was made and filled with water to create humidity. Sorghum grain culture method of artificial inoculation for MLB (Singh *et al.* 2004) was used to inoculate at 30-45 cm plant height. The data were recorded following a uniform rating scale of 1-5 ( $\leq 2.0$  = resistant; 2.1-3.0 = moderately resistant/tolerant;  $> 3.0$  = susceptible). Tooth pick method of artificial inoculation for Charcol rot suggested by Payak and Sharma (1979) was used to create disease epiphytotic condition at 45-50 days old plants. The disease severity was recorded on scale of 1-9 ( $\leq 3.0$  = resistant; 3.1-6.0 = moderately resistant/tolerant;  $> 6.0$  = susceptible/highly susceptible).

### Results and discussion

Reaction against Maydis Leaf Blight: The reaction against MLB at Ludhiana and Karnal was presented in Table 1. The results indicated that the disease reaction occurred in the range of 2.0 to 4.0 (Ludhiana) and 1.5 to 4.0 (Karnal). The susceptible checks viz., Winpop-1(3.5) and HKI 536 (4.0) at Ludhiana and Karnal respectively recorded susceptible reaction. Among the inbreds,



DQL 2015, DQL 2024, DQL 2025 and DQL 2071 recorded 2.0 score at both locations. Hence these inbreds were rated as resistant. The inbreds DQL 2006, DQL 2048, DQL 2054 and DQL 2055 were found susceptible with disease score above 3.0 in both at least at one location. Other inbreds were considered as moderate resistant.

Reaction against Charcol rot:The disease reaction against charcoal rot at Delhi and Ludhiana was presented in Table 2. The results indicated that the disease reaction ranged from 1.3 to 6.5 (Delhi) and 2.5 to 7.7 (Ludhiana). Among the inbreds, none of the inbreds were rated as resistant with score below 3.0. However, the inbreds DQL 2008-1, DQL 2009, DQL 2010, DQL 2015, DQL 2028, DQL 2031, DQL 2034, DQL 2039, and DQL 2071 were considered as moderately resistant with score between 3.1 and 6.0 at both locations. Inbreds DQL 2006, DQL 2019, DQL 2024, DQL 2025, DQL 2038, DQL 2048, DQL 2054 and DQL 2055 recorded disease score more than 6.0 in at least one location and hence considered as susceptible. Other workers have also evaluated maize lines for locating resistance sources against major diseases (Singh *et al.*, 2004 ; Das and Dhanju, 2005; Sharma *et al.*, 2005; Kaur *et al.*, 2010 and Kumar and Saxena, 2008).

From the foregoing discussion, it may be concluded that inbreds DQL 2015 and DQL 2071 were found as resistant for MLB and moderately resistant to charcoal rot. These results are of one season only and hence need to be confirmed for one more season. After the confirmation of resistance, these

inbreds can be used disease resistance breeding programme because of multiple disease resistance.

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**Table 1. Disease reaction of different QPM lines against MLB at Ludhiana and Karnal during Kharif, 2013**

S.No.	Pedigree	Ludhiana	Karnal	Average score
1	DQL-2006	4.0	2.0	3.00
2	DQL-2008-1	3.0	N.G.	3.00
3	DQL-2009	2.5	3.0	2.75
4	DQL-2010	2.0	N.G.	2.00
5	DQL-2015	2.0	2.0	2.00
6	DQL-2019	2.5	2.0	2.25
7	DQL-2024	2.0	2.0	2.00
8	DQL-2025	2.0	2.0	2.00
9	DQL-2028	2.5	2.0	2.25
10	DQL-2031	2.5	2.0	2.25
11	DQL-2034	3.0	2.0	2.50
12	DQL-2038	2.0	N.G.	2.00
13	DQL-2039	2.5	N.G.	2.50
14	DQL-2048	2.5	4.0	3.25
15	DQL-2054	4.0	3.0	3.50
16	DQL-2055	3.5	N.G.	3.50
17	DQL-2071	2.0	2.0	2.00
	<b>Winpop-1 (Susceptible Check)</b>	3.5	-	-
	<b>DR - 99 x ent 49 (Resistant Check)</b>	2.0	-	-
	<b>HKI 536 CBT (Susceptible Check)</b>	-	4.0	-
	<b>HKI 1128 (Resistant Check)</b>	-	1.5	-



**Table 2. Disease reaction of different QPM lines against Charcol rot at Delhi and Karnal during Kharif, 2013.**

S.No.	Pedigree	Delhi	Ludhiana	Average score
1	DQL-2006	4.0	7.2	5.60
2	DQL-2008-1	5.8	6.0	5.90
3	DQL-2009	4.2	3.0	3.60
4	DQL-2010	5.2	2.5	3.85
5	DQL-2015	3.5	3.5	3.50
6	DQL-2019	6.2	6.0	6.10
7	DQL-2024	2.5	7.7	5.10
8	DQL-2025	4.9	7.0	5.95
9	DQL-2028	4.5	4.3	4.00
10	DQL-2031	3.0	4.6	3.80
11	DQL-2034	3.0	5.2	4.10
12	DQL-2038	1.3	6.3	3.80
13	DQL-2039	3.3	5.0	4.15
14	DQL-2048	3.8	6.2	5.00
15	DQL-2054	6.5	3.0	4.75
16	DQL-2055	3.0	6.2	4.60
17	DQL-2071	2.7	5.0	3.85
	<b>Winpop-1 (Susceptible Check)</b>	-	<b>7.5</b>	-
	<b>LM 13 (Resistant Check)</b>	-	3.1	-
	<b>CM 600</b>			-
	<b>(Susceptible Check)</b>	4.2	-	
	<b>PFSR-R<sub>3</sub>(Resistant Check)</b>	1.9	-	-