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Effect of Mungbean Yellow Mosaic Virus (MYMV) on Yield and Yield Components of Mungbean (*Vigna radiata* (L.) Wilczek)

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ABSTRACT

Fourteen MYMV susceptible F_3 progenies from a cross NM 92 x VC 1560D showed significant differences for MYMV disease infection, yield and yield components. These progenies suffered from 18.5 to 40.5 percent decrease in plant height, 11.7 to 64.0 percent reduction in number of pods per plant, 5.8 to 82.2 percent reduction in seeds per pod, 7.4 to 35.0 percent decrease in pod length, 10.6 to 53.3 percent reduction in 1000 seed weight and 32.2 to 78.6 percent decrease in grain yield per plant. The MYMV incidence showed significant correlation (0.526) with the decrease in 1000 seed weight. The decrease in yield and other yield components showed non significant positive correlation with MYMV incidence.

Key words : mungbean yellow mosaic virus, yield, mungbean

INTRODUCTION

Mungbean Yellow Mosaic Virus (MYMV) has been found widely distributed in India and Pakistan causing enormous losses in the production of several leguminous crops (Chenulu and Verma, 1988). The most seriously affected leguminous crops by this disease are mungbean, blackgram and soybean. It is the most destructive disease of mungbean during summer season in Pakistan (Ahmad, 1975). MYMV disease is reported to be transmitted by an insect vector, *Bemisia tabaci* and not by seed, soil and mechanical inoculation (Nair and Nene, 1973; Ahmad and Harwood, 1973). The effect of disease varies with cultivar to cultivar and is subjected to the genetic make up of the cultivar. The present study reports the results on the quantitative determination of the effect of MYMV disease on the yield and yield components of the susceptible F_3 progenies from the cross of a local MYMV resistant variety NM 92 and an exotic MYMV susceptible accession VC 1560D.

MATERIALS AND METHODS

Fourteen F_3 MYMV susceptible progenies resulting from a cross of NM 92 x VC 1560D along with the MYMV susceptible parent VC 1560D were planted in a randomized complete block design in three replications at Nuclear Institute for Agriculture and Biology, Faisalabad – Pakistan during summer 1997 in two sets of trial. The progenies were planted in 2 m long, 2 rows per plot with 30 and 10 cm distances between rows and pants respectively. Of the two sets of trials, one was protected from whiteflies invasion and hence from MYMV infection, by spraying insecticide Polo at the rate of 250 ml/ha at five days interval from 15th

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day of sowing. The second trial was subjected to natural invasion of white flies. The epiphytotic conditions were created by planting mung kabuli (MYMV susceptible check) around and in the trial after each entry as a spreader for MYMV disease inoculum to the vector (whitefly). Both the trials were planted at a distance from each other to maintain the ideal conditions of each trial.

The MYMV disease infection was recorded in percent at the peak of the disease on the basis of whole plot in each replication from unprotected (diseased) trial. At physiological maturity five plants from each plot in each replication of protected (healthy) and unprotected (diseased) trial were randomly selected and data were recorded for plant height, pods per plant, pod length, seeds per pod, 1000 seed weight and grain yield per plant. The decrease over control in percent was calculated for each character by the following formulla:

$$\text{Decrease over control (\%)} = \frac{\text{Pr otected plot value} - \text{Unprotected plot value}}{\text{Protected plot value}} \times 100$$

The analysis of variance of all the characters and correlation coefficient between the MYMV incidence and decrease in yield and yields components were performed on microcomputer using MSTATC Software.

RESULTS AND DISCUSSION

All the entries in both sets of trial were found significantly different from each other for all the characters (Table 1) Effect of MYMV infection on yield and yield components of F_3 susceptible progenies of mungbean varied greatly (Table 2). All the entries were invariably affected by virus infection and suffered 18.5 to 82.2 percent in seeds per pod. Pod length, though much less affected, suffered from 7.4 to 35.0 percent decrease. The seed size and grain yield per plant suffered from 10.6 to 52.3 percent and 32.2 to 78.6 percent reduction respectively. Singh (1981) reported the disease to cause considerable reduction in growth components and upto 38.2 percent reduction in plant height of mungbean. Chand and Verma (1983)

Table 1 Mean square values from ANOVA of yield and yield components of F_3 progenies of mungbean evaluated in two sets of trial.

SOV	Disease incidence (%)	Plant height (cm)	Pods per plant (g)	Seeds per pod	Pod length (cm)	1000 seed wt (g)	Grain yield per plant
Protected							
Rep.	-	1.48^{NS}	1.98^{*}	0.02^{NS}	0.31^{NS}	3.56^{*}	0.17
Ent.	-	57.75^{**}	23.22^{**}	1.27^{**}	1.31^{**}	71.93^{**}	5.27^{**}
Error	-	2.27	0.53	0.05	0.15	0.63	0.59
Unprotected							
Rep.	1.63^{NS}	0.91^{NS}	0.46^{NS}	0.17^{NS}	0.08^{NS}	0.15^{NS}	0.05^{NS}
Ent.	89.08^{**}	78.44^{**}	49.62^{**}	0.94^{**}	0.79^{**}	67.98^{**}	2.92^{**}
Error	5.38	0.63	0.47	0.06	0.05	1.10	0.27

*,** = Significant at P<0.05 and 0.01 respectively.
NS = Non significant.

Table 2 MYMV incidence (%) and decrease over control (%) of yield and yield components due to MYMV in mungbean F3 progenies.

Ent/ Progeny	Disease incidence	Plant height (cm)			Pod length (cm)			Seeds/Pod			Pods/Plant			1000 seed weight (g)			Grain yield/Plant (g)		
	(%)	H. plants	D. Plants	Decrease over control (%)	H. plant	D. Plants	Decrease over control (%)	H. plant	D. Plants	Decrease over control (%)	H. plants	D. Plants	Decrease over control (%)	H. plant	D. Plants	Decrease over control (%)	H. plant	D. Plants	Decrease over control (%)
1.	58.0fg	63.1cde	50.8a	19.5	8.1f	7.0cde	13.6	6.9e	6.5efg	5.8	27.9a	10.2ef	63.4	46.9g	40.5cde	13.6	10.2ef	3.3efg	67.6
2.	68.0de	61.8de	48.6b	21.4	8.1f	7.5b	7.4	8.3d	7.0bcd	15.7	22.3de	19.0a	14.8	42.4h	37.9fg	10.6	8.7g	5.9a	32.2
3.	65.7e	56.8f	40.9f	28.0	9.1de	6.8de	25.3	8.7cd	6.6def	24.1	21.9e	17.5b	20.1	52.7e	41.4cd	21.4	11.5abcde	4.7bcd	59.1
4.	66.3e	61.9de	36.8h	40.5	9.0de	7.2bcd	20.0	8.7cd	6.5efg	25.3	22.1e	10.4ef	52.9	50.2f	37.9fg	24.5	10.1efg	3.1fg	69.3
5.	66.0e	56.6f	39.0g	31.1	8.4ef	7.0cde	16.7	8.3d	6.3fg	24.1	21.7e	12.9d	40.6	54.2d	42.1c	22.3	11.0cdef	3.5ef	68.2
6.	71.3cd	56.9f	36.4h	36.0	8.8de	6.8cde	22.7	8.6d	6.9cd	19.8	18.4g	11.4e	38.0	54.7cd	44.3b	19.0	8.8g	3.5ef	60.2
7.	72.0cd	67.9a	44.5d	34.5	9.5bcd	6.8cde	28.4	9.1b	6.1ghi	33.0	27.2a	9.8f	64.0	46.6g	37.4gh	19.7	11.7abcd	2.5g	78.6
8.	75.0bc	56.7f	39.4g	30.5	8.8de	6.8cde	22.7	8.5d	6.3fgh	25.9	25.9b	10.3ef	60.2	51.7e	40.2de	22.2	11.5abcde	3.2fg	72.2
9.	57.7fg	60.6e	49.4b	18.5	9.4cd	7.2bcd	23.4	8.5d	6.8de	20.0	23.8c	18.4ab	22.7	42.8h	35.3i	17.5	9.7fg	3.8def	60.8
10.	56.3g	62.0de	39.8fg	35.8	9.1de	8.2a	9.9	9.3ab	7.3abc	21.5	24.6c	18.5ab	24.8	47.5g	39.1efg	17.7	11.2bcde	3.8def	66.1
11.	61.4f	51.8g	39.2g	24.3	10.1ab	8.2a	18.8	9.0bc	7.4ab	82.2	23.5cd	18.2ab	22.6	49.5f	35.7hi	27.9	12.3abc	5.2ab	57.7
12.	71.6cd	66.3ab	49.9ab	24.7	8.9de	6.8cde	30.9	9.3b	5.9hi	36.6	21.4e	18.9a	11.7	55.6bc	39.5ef	29.0	12.9a	5.1abc	60.5
13.	77.1ab	65.4abc	46.1c	29.5	10.3a	6.7e	35.0	9.7a	5.7i	41.2	20.1f	14.9c	25.9	56.6ab	45.9ab	18.9	12.6ab	4.2cde	66.7
14.	54.1g	62.6de	49.1b	21.6	9.9abc	7.2bc	27.3	9.3ab	6.1ghi	34.4	18.7g	8.3g	55.6	55.9bc	46.7a	16.5	10.7def	2.5g	76.6
VC1560D (Parent)	80.0a	64.2bcd	42.8e	33.3	9.1de	7.9a	13.2	9.1b	7.6a	16.5	21.9e	18.1ab	17.4	57.4a	27.4i	52.3	12.7a	3.7def	70.9

H-Healthy D-Diseased

reported that mungbean cultivars might suffer 66.6 percent decrease in plant yield and 25.7 percent decrease in 1000 seed weight due to MYMV. Ayub *et al.* (1989) reported reduction upto 91.6, 24.7, 56.6 and 80.2 percent for pod number, pod size, seed/pod and plant yield respectively in mungbean.

The variation in the effect of MYMV on yield and yield components among the F_3 progenies in the present study may be explained on the basis of differences in the genetic make up of the progenies resulting from new recombinations due to crossing over of the genetic material during meiosis. The variation may also be expected on the basis of early or late infection of the cultivars, as early and severely infected plants usually bear much number of pods while latter infection has been reported to delay plant maturity and yield (Singh, 1980, Singh *et al.* 1982).

The decrease in yield and yield components was positively correlated with MYMV incidence (Table 3) indicating that the MYMV disease affected each component and decreased yield as well. Decrease in 1000 seed weight showed highest significant correlation coefficient (0.526) with MYMV disease amongst all the yield components.

Table 3 Correlation between disease (MYMV) incidence and decrease in yield and yield components due to MYMV in mungbean F_3 progenies.

Character	Disease (MYMV) incidence
Plant height	0.434
Seeds per pod	0.024
Pod length	0.254
Pods per plant	0.149
1000 seed wt.	0.526*
Grain yield per plant	0.033

* = Significant at P<0.05

This adverse effect of MYMV incidence on 1000 seed weight might be the main cause of decrease in yield. Yohe and Poehlman (1975) also reported significant and negative correlation between virus score and yii $ components.

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