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CHARACTERIZATION OF CONDUCIVE ENVIRONMENTAL CONDITIONS FOR MUNGBEAN YELLOW MOSAIC VIRUSDISEASE INCIDENCE ON MUNGBEAN GERMPLASM

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A B S T R A C T

Conducive environmental conditions for the development of *Mungbean yellow mosaic virus* (MYMV) diseasewere characterized. Correlation of environmental conditions (maximum and minimum air temperature, relative humidity, rainfall, clouds and windvelocity) with MYMV disease incidence was determined on twenty varieties/lines of mungbean. It was revealed that maximum temperature had significantly negative correlation with the disease incidence. The disease incidence increasedwith the decrease of minimum temperature.Minimum temperature and wind velocity had non-significant correlation with MYMV disease incidence. It was also found that relative humidity and rainfall had significant correlation with *Mungbean yellow mosaic virus*disease incidence.

Keywords: Characterization, conducive, environmental conditions, MYMV, incidence.

INTRODUCTION

Mungbean (*Vignaradiata*L.) is an important pulse crop belonging to the Leguminasae family. In Pakistan, mungbean ranked second important crop after chickpea (*Cicerarietinum*). The total area cultivated with mungbean crop in Pakistan is estimated about 232.10 thousand hectares with total annual production of 157.40 thousand tones (Anonymous, 2012).

Yellow mosaic disease (YMD) caused by Mungbean yellow mosaic virus (MYMV) is the most economically important virus that cause heavyyield losses especially to the summer crop. Disease incidence of MYMV is ranged from 4% to 40% in Pakistan, and yield losses dependent upon crop variety and environmental conditions at aparticular location (Bashir *et al*., 2006). MYMV is transmitted by whitefly, (*Bemisia tabaci* Gennadius). The virus cannot transmit by mechanical inoculation or by seeds (Shad *et al.*, 2006).The virus causes uneven yellow and green specks or patches on the leaves that later develop to yellowish. MYMV infected plants give fewer flowers producing small and shrunken pods (Habib*et al*., 2007).

Epidemiological factors play pivotal role in the development of MYMV disease (Khan *et al*., 2012). The change in climate, affects the biology and distribution of whitefly (Nath and Saikia, 1995). Higher temperature and dry climate favors the more MYMV disease incidence which may had directly influenced the vector population and its migration behavior (Salam *et al*., 2011).Keeping in view the above mentioned facts, it is important to collect detailed information regarding the host, pathogen and other environmental factors which may lead to the development of epidemics. Understanding of the epidemiology of MYMV will enable us to precisely forecast its development, which will ultimately help the farmers to take up plant protection measures more accurately. The objective of this study was to identify the environmental conditions favorable for the development of MYMV disease.

MATERIALS AND METHODS

Twenty one varieties/lines, representingNM-6, C2-94-436, 07006,07007, 07008,07002, 08002,08003, 08004, 08007,08009,08010,93013, 07009, Azri-06, 98002, 97017, 97012, 07005, 07004 and 08008, were sown in the research area of the Department of Plant Pathology, University of Agriculture, Faisalabad, Pakistan. Each variety was sown in three replications with 60cm row to row and 20cm plant to plant distance. In order to ensure the virus source one row of spreader "KM-5" was sown

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after every three lines of the varieties/lines to be evaluated against MYMV. The conventional agronomic practices were followed to keep the crop in good condition.

Environmental data, consisting of maximum and minimum temperature (°C), rainfall (mm), clouds, relative humidity (%) and wind velocity(Km/h) were collected from a meteorological station, 100 m away from the research trial area i.e., Department of Crop Physiology, University of Agriculture, Faisalabad, Pakistan. Data regarding MYMV disease incidence was recorded based upon visual observation of the characteristic symptoms weekly. The environmental and disease incidence data were statistically analyzed using Pearson's correlation coefficient for disease incidence and environmental factor. It was subjected to determine the correlation analysis to find out their relationship with development of MYMV (Steel *et al*., 1997).

The disease incidence (D.I.) was calculated by using the formula (Latham and Jones, 2001):

$$(\%)\ \text{Disease incidence} = \frac{\text{No. of infected leaves}}{\text{Total No. of leaves}} \times 100$$

RESULTS AND DISCUSSION

In general, temperature (maximum and minimum), relative humidity and rainfall were the most effective factors in the MYMV disease development. Maximum temperature showed significantly negative correlation towards the development of MYMV disease in fourteen varieties/lines (NM-6, C2-94-436, 07006, 07007, 07008, 07002, 08002, 08003, 08004, 08007,08009,08010,93013 and07009). Whereas, the contribution of the maximum temperature was not significant for MYMV disease development in the remaining varieties/lines (Azri-06, 98002, 97017, 97012, 07005, 07004 and 08008) (Table1). The correlation of maximum temperature with percent plant infection for all varieties was non-significant. A negative correlation between maximum temperature and percent plant infection was seen where with the increase of maximum temperature, from 36.5 to 38.5°C, the percentage of plant infection was decreased (Khan *et al*., 2012).

Table 1. Correlation between Mungbean yellow mosaic virus disease incidence and different environmental variables.

Variety	Temperature (°C)		Relative humidity	Rainfall (mm)	Wind speed
	Maximum	Minimum	(%)		(Km/h)
NM-6	-0.764*	0.313	0.881**	0.722	0.404
	0.045	0.495	0.009	0.067	0.368
Azri-06	-0.752	0.329	0.808*	0.680	0.309
	0.051	0.472	0.028	0.093	0.501
C2-94-436	-0.776*	0.296	0.881**	0.718	0.38
	0.040	0.519	0.009	0.069	0.401
98002	-0.725	0.357	0.697	0.573	0.276
	0.065	0.432	0.082	0.179	0.548
07004	-0.736	0.354	0.760*	0.616	0.312
	0.059	0.436	0.047	0.140	0.495
07005	-0.747	0.284	0.713	0.639	0.190
	0.054	0.537	0.072	0.122	0.683
07006	-0.772*	0.290	0.833*	0.726	0.281
	0.042	0.529	0.020	0.065	0.541
07007	-0.799*	0.223	0.911**	0.774*	0.350
	0.031	0.630	0.004	0.041	0.442
07008	-0.769*	0.244	0.912*	0.799*	0.300
	0.043	0.599	0.004	0.031	0.514
07002	-0.762*	0.365	0.850*	0.698	0.43
	0.046	0.421	0.015	0.081	0.336
08002	-0.796*	0.230	0.905**	0.798*	0.310
	0.032	0.620	0.005	0.031	0.499
08003	-0.796*	0.230	0.905**	0.798*	0.310

08004	0.032	0.620	0.005	0.031	0.499
	-0.779*	0.254	0.818*	0.713	0.262
	0.039	0.583	0.024	0.072	0.571
08007	-0.772*	0.290	0.833*	0.726	0.281
	0.042	0.529	0.020	0.065	0.541
08008	-0.752	0.329	0.808*	0.680	0.309
	0.051	0.472	0.028	0.093	0.501
08009	-0.813*	0.192	0.866*	0.783*	0.259
	0.026	0.679	0.012	0.037	0.574
08010	-0.804*	0.257	0.915**	0.763*	0.406
	0.029	0.579	0.004	0.046	0.366
93013	-0.786*	0.208	0.917**	0.796*	0.309
	0.036	0.654	0.004	0.032	0.501
97017	-0.752	0.329	0.808*	0.680	0.309
	0.051	0.472	0.028	0.093	0.501
97012	-0.749	0.291	0.936**	0.780*	0.379
	0.053	0.527	0.002	0.038	0.402
07009	-0.776*	0.274	0.878**	0.735	0.344
	0.040	0.551	0.009	0.060	0.450

Upper values indicate to Pearson's correlation coefficient
Lower values indicate to level of significance at 5% probability

Relative humidity was also contributed significantly in the MYMV disease development in all the varieties/lines with exception of two varieties representing 07005 and 09008 in which correlation of MYMV disease incidence was non-significant. This indicated that MYMV disease incidence increased with the increase of relative humidity. These results are supported by similar findings on okra crop as the rate of dissemination of *Okra yellow vein mosaic virus* (OYVMV) increased during high relative humidity (Bhagat*et al.,* 2001).

Eight varieties/ lines (07007, 07008, 08002, 08003, 08009, 08010, 93013 and 97012) showed significant correlation between MYMV disease incidence and rainfall while remaining varieties/lines (NM-6, Azri-06, C2-94-436, 98002, 07004, 07005, 07006, 07002, 08004, 08007, 08008, 97017 and 07009) showed non-significant relationship. Eight okra varieties were evaluated for resistance to Okra yellow vein mosaic virus (OYVMV) in the rainy and summer season. The incidence of YVMV was higher during the rainy season when relative humidity was very high, while YVMV incidence was very low during summer season because of low relative humidity. All the varieties/lines showed non-significant correlation with minimum temperature and wind speed for the development of YVMV disease (Sangar, 1997).The influence of air temperatures, rainfall and relative humidity was found significant on whitefly and MYMV disease incidence(Khan *et al*., 2006). MYMY disease severity decreased with increasing temperature when checked in different sowing dates (Rashid *et al*., 2013). Some conflicting observations were also made as MYMV incidence increased with the increase in temperature because whitefly population more conveniently in high temperature (Rahman*et al*., 2006).

CONCLUSION

The conducive environmental conditions for the MYMVD were characterized in fourteen varieties/lines. Maximum temperature and relative humidity had significant effect on disease development. These findings would be helpful in successful prediction as well as timely and economical management of MYMV disease.

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