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# SCREENING OF MUNGBEAN GERMPLASM AGAINST MUNGBEAN YELLOW MOSAIC VIRUS AND URDBEAN LEAF CRINKLE VIRUS

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## ABSTRACT

Mungbean [*Vigna radiata* (L) Wilczek] is considered as a pulse crop having high nutritional value containing large amount of protein contents. Destructive diseases of mungbean causing poor seed quality as well as reduce the yield are Mungbean Yellow Mosaic Virus (MYMV) and Urdbean Leaf Crinkle Virus (ULCV). The experiment was conducted in field conditions at research area of Department of Plant Pathology, University of Agriculture, Faisalabad. Screening of twenty mungbean varieties/lines was performed against both viruses. A check was sown after every four cultivars named as Kabuli mung. Not a single cultivar exhibited highly resistant and resistant reaction against MYMV along with ULCV. In case of MYMV moderately resistant response showed by three varieties (Azari-06, NM-2011, NM-2006), moderately susceptible response by one variety (NM-121-125), susceptible response by four cultivars (NM-92, NM-54, 11002, NM-28) and highly susceptible response includes twelve cultivars (NM-51, NM-98, NM-20-21, NM-19-19, 7006, 11009, 11010, 11003, 11011, 11007, 110047008). Whereas, response of mungbean cultivars against ULCV showed that three varieties were found moderately resistant (Azri-06, NM-2011, NM-2006), four cultivars were found moderately susceptible (NM-54, NM-28, 11002, NM-92), four cultivars were found susceptible (NM-51, 11003, 11011, 11004,) and nine cultivars were found highly susceptible (NM-98, NM-20-21, NM-19-19, NM-121-125, 7006, 11009, 7008, 11010, 11007).

**Keywords:** disease resistance, mungbean germplasm, MYMV, ULCV

## INTRODUCTION

Mungbean (*Vigna radiata* (L) Wilczek), mainly originated from India is considered as a vital source of food which provides high amount of protein (Tabasum *et al.,* 2010). In tropical and sub-tropical regions this crop is grown as monoculture crop as well as cropping system. Mungbean, annually covered an area of six million hectares as a legume crop. Contribution of Asia is 90% in total worldwide

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production of mungbean, among these India is considered as the largest country for mungbean production with approximately contribution of 54% of mungbean production globally. In Punjab mungbean covered an area of about 80-85%, major districts in Pakistan producing mungbean such as Layyah, Bhakar and Mianwali (Bashir *et al*., 2006). Different minerals are present in seeds of mungbean including magnesium, calcium, potassium, iron and phosphorous as well as different vitamins such as niacin, ascorbic acid, riboflavin, pantothenic acid, vitamin A, and thiamine (Duke, 1981). Soil fertility was improved by remaining of mungbean after harvest as well as for animal feed (Asaduzzaman, 2008). Mungbean is being cultivated two times in the year one is in spring and second in autumn. Ranking of mungbean is second in Pakistan after chickpea on the basis of production potential (Ali *et al.,* 2010). Biotic as well as abiotic factors are causing reduction in yield of mungbean. Among them, viral diseases are devastating and widely distributed that cause number of losses in mungbean (Paul *et al*., 2013). Major viral diseases are MYMV, Cucumber Mosaic Virus (CMV), ULCV, Alfalfa Mosaic Virus (AMV) and Bean Yellow Mosaic Virus (BYMV) (Bashir *et al*., 2006). Mungbean yellow mosaic disease is one of the most devastating diseases of mungbean which affected growth parameters of mungbean crop adversely (Verma *et al.,* 1983). ULCV is also known as very damaging and severe disease of mungbean as this crop is more infected by ULCV when compared with other legume crops (Bashir *et al*., 2005; Ashfaq *et al*., 2007).

First report on the occurrence of MYMU was given by Nariani (1960). Distinctive MYMV symptoms include presence of mosaic pattern that exist in the form of patches such as green and yellow on the infected leaves. Number of flowers was reduced due to the infection caused by MYMV as well as pods are shriveled and small (Habib *et al.,* 2007). Symptoms exhibited by ULCV on infected plants include crinkling of leaves along with curling, crumpling, rugosity of leaves. As a result, undersized growth and production of malformed organs were observed. Whitefly (*Bemisia tabaci* Genn.) is considered as a vector for MYMV transmission (Shad *et al.,* 2006). Grafting, sap inoculation and seeds are the methods used for transmission of ULCV in mungbean (Kolte and Nene, 1972); Ahmed *et al.* (1997). Whereas, transmission by vectors of ULCV reported through beetles, jassids and whitefly (*B. tabaci* Genn.). 4-40% incidence was reported for (MYMU) (Bashir *et al.,* 2006). Yield losses reached up to 100% when the attack of virus occurred at the time of seedlings appearance (Usharani *et al*., 2004). Grain yield losses caused by ULCV ranged from 35-81% in Pakistan (Bashir *et al*., 1991). MYMV having icosahedral particles and having single stranded DNA which infect the plants. According to their genome organization these are referred as monopartite as well as bipartite (Mansoor *et al*., 2003; Jeske, 2009). The size of both components of DNA is roughly estimated as 2.8 kb (Borah and Dasgupta, 2012). Now-a-days, various methodologies are being used to control among all these the cheapest methods that is very useful in controlling the disease is referred as the host plant resistance (Dhingra, 1975). The experiment was conducted with the main objective to find out the resistant germplasm against the disease which is durable and ecofriendly approach to combat with the disease. Correct diagnosis of MYMV and ULCV is based on symptomology.

## MATERIALS AND METHODS

### Germplasm collection

Twenty varieties and lines of mungbean viz. NM 121-125, Azari-06, NM-54, NM-2006, NM-51, NM-20-21, NM-28, NM-92, NM-2011, NM-98, NM-19-19, 11003, 11009, 11002, 07006, 11004, 11010, 11007, 11011, 07008 and one variety of Kabuli mung which was used as a check were obtained from Nuclear Institute for Agriculture and Biology (NIAB) and Pulses Section of Ayub Agricultural Research Institute (AARI), Faisalabad. These varieties were selected from available germplasm on the basis of commercial value.

### Establishment of screening nursery

Screening nursery was maintained in Research area of Department of Plant Pathology, University of Agriculture, Faisalabad under field conditions. The land was appropriately pulverized with a cultivator, followed by planking for sowing of mungbean seeds. Augmented design was followed for screening experiment. No treatment was used in screening experiment and normal cultural practices were followed to keep the experiment under good condition. Disease incidence was observed under natural conditions. A spreader of highly susceptible variety Kabuli mung was used after each four rows and around the experimental area. After raising of plants, data concerning disease incidence was recorded on the basis of first symptom appeared on diseased plants. All the evaluated varieties were categorized by using disease rating scale separately for both viruses ULCV and MYMV. Disease incidence was calculated by using the following formula Waller *et al*. (2002).

$$\mathrm{DI} = \frac{\text{No. of infected leaves}}{\text{Total No. of leaves}}\ X\ 100$$

## RESULTS AND DISCUSSION

### Response of mungbean germplasm against MYMV and ULCV

Highly resistant and resistant response was not show by any cultivar against the MYMV. The cultivars that showed moderately resistant and moderately susceptible reaction against the MYMV are NM-2011, Azari-06, NM-2006 and NM-121-125, respectively. Those cultivars showed susceptible response including 11002, NM-92, NM-28 and NM-54. Highly susceptible response against MYMV showed by the cultivars such as NM-51, NM-98, NM-19-19, NM-2021, 11009, 7006, 11004, 11010, 7008, 11011, 11003, 11007. Response of mungbean cultivars against urdbean leaf crinkle virus showed that none of the variety or line was found highly resistant or resistant. Moderately resistant varieties against ULCV includes NM-2006, Azari-06, and NM-2011 while moderately susceptible varieties/lines against ULCV includes NM-54, NM-92, NM-28, and 11002. Varieties/lines showing susceptible response against the infection of ULCV are as follows: NM-51, 11011, 11004 and 11003, while those showing highly susceptible response including NM-20-21, NM19-19, NM-98, NM 121-125, 7006, 11009, 11007, 11010 and 07008. Kabuli mung which was used as a check was found highly susceptible to ULCV infection. The results found

against MYMV infection in mungbean cultivars are closely related to the results of Ahmad *et al.* (2013). Hundred genotypes of mungbean were assessed under the field environmental conditions and their response against the viral infection exhibited that tolerant response showed by thirty-five varieties while moderately tolerant response showed by seventeen genotypes of mungbean. The genotypes left behind exhibited susceptible, moderately susceptible and highly susceptible response against the infection of MYMV. It was concluded that lack of resistance was found in genotypes of mungbean against the MYMV infection.

The results of screening experiment against ULCV infection were found to be comparable with the work of Bashir and Zubair (2002); Singh *et al*. (2000). One hundred and thirty two genotypes were evaluated against both of these viruses MYMV and ULCV in field conditions. Highly resistant response against the infection of ULCV was found in 26% genotypes of mungbean while against MYMV infection mungbean genotypes that exhibited highly resistant response are 53%. Mungbean genotypes exhibited different disease resistance levels against the infection of ULCV along with MYMV.

**Table 1.** Disease rating scale (0-5) for MYMV disease

| Severity | % Infection | Visual Symptoms | Response |
|---|---|---|---|
| 0 | Asymptomatic Plants | No symptoms at all | HR |
| 1 | Up to 10 | Scattered small leaf spots of yellow color | R |
| 2 | 11-20 | Yellowish and bright spots, observed easily | MR |
| 3 | 21-30 | Bright yellow specks, easily observed, large in patches | MS |
| 4 | 30-50 | Leaves covered with yellow specks, slightly stunted, less in pods | S |
| 5 | <50 | Chlorosis, yellowing of all foliage, small internodes, stunting, deformed pods with immature and aborted seed | HS |

**Table 2.** Disease rating Scale (0-5) for ULCV disease

| Severity Index | Rate of Infection (%) | Visual symptoms | Response |
|---|---|---|---|
| 0 | No symptoms | Plants are free of symptoms | HR |
| 1 | 1>10 | Mild crinkling | R |
| **2** | 10>20 | Top lesaves curling and crinkling | MR |
| **3** | 20>30 | Pods shortened, malformed, plants showing puckering and crinkling | MS |
| **4** | 30>40 | Plants with all the above symptoms | S |
| **5** | <40 | Few pods with few seeds, severe symptoms on all plants | HS |

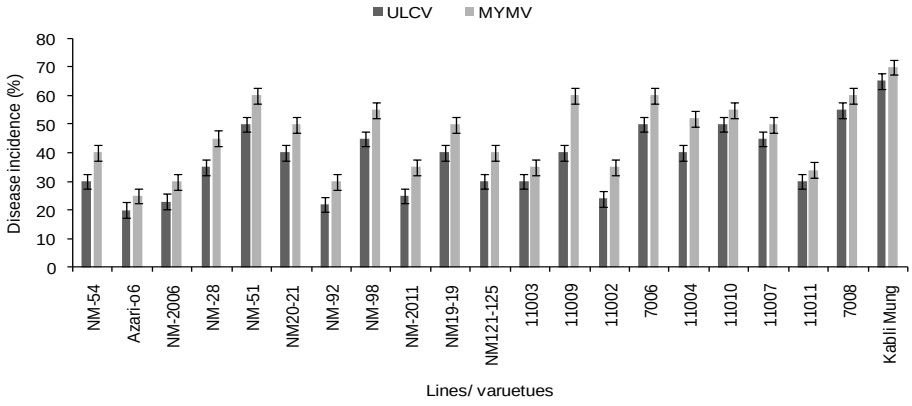


**Figure 1.** Response of mungbean lines/varieties against ULCV and MYMV

## CONCLUSION

It was concluded after the results of screening experiment that germplasm of mungbean is having narrow genetic diversity against both of the viruses MYMV and ULCV. Absence of certified or registered seed is the major limitation in mungbean production.

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