

Occurrence and symptomatology of mungbean yellow mosaic virus (MYMV) in mungbean [*Vigna radiata* (L.) Wilczek] in south Gujarat

DNYANESHWAR M. PAWAR AND LALIT MAHATMA

Department of Plant Pathology, N.M. College of Agriculture, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA
Email : mavli111pawar@gmail.com

Mungbean [*Vigna radiata* (L.) Wilczek] is one of the important pulse crop, primarily grown for food in India. During the survey, occurrence of mungbean yellow mosaic virus (MYMV) in mungbean was noticed in serious proportion causing heavy losses in Navsari, Surat and Valsad district. Cultivar GM-4 and K-851 were found more severely affected at the flowering stage during summer season. Roving field surveys were under taken in and around Navsari, Surat and Valsad district, the total 16 location to find out occurrence of the mungbean yellow mosaic virus (MYMV) during the summer 2010 in the field. The MYMV incidence increased with increase in the crop stages. Crop at the first trifoliolate leaf stage was 08-12 per cent, second trifoliolate leaf stage was 16-20 per cent, before flowering stage were observed 41 to 55 per cent incidences and at the time of maturity stage showed 65-76 per cent incidence of MYMV. Fields of Sugarcane Research Station, N.A.U., Navsari farm were observed periodically. Three popular varieties of mungbean viz., K-851, GM-4, GM-3 variety were sown in the field. None of the variety showed resistance against the disease and 75 to 100 per cent incidence was observed at the time of maturity. Among these, K-851 showed cent per cent incidence of the MYMV. The disease appeared in the field as small scattered yellow to golden yellow colour flecks on the infected leaves. These were scattered on the entire leaves and were more concentrated near the leaf venation. The severity of the symptoms could be seen in the newly emerging leaves, where in case of high susceptibility cent per cent area of the leaf turned yellow. The symptoms could be observed on all the green colored aerial part of the plants including cotyledon leaf, trifoliolate leaves, stem, petiole, flower part, pod and seeds. Infected plant remained stunted with few pods of small size and shriveled seed.

Key words : Yellow mosaic of mungbean, Symptomatology Y.M.D.

How to cite this paper : Pawar, Dnyaneshwar M. and Mahatma, Lalit (2013). Occurrence and symptomatology of mungbean yellow mosaic virus (MYMV) in Mungbean [*Vigna radiata* (L.) Wilczek] in south Gujarat. *Asian J. Bio. Sci.*, **8** (2) : 237-240.

INTRODUCTION

India is considered as homeland of most grain legumes and major chunk of protein is supplied by pulses to majority of Indians dietary system due to their richness in protein and other important nutrients. Pulses belong to the family (Fabaceae) (Leguminosae). Important pulses crops grown in India are soybean, gram, pigeon pea, mungbean, urdbean, cowpea, French bean etc. Among pulses, mungbean [*Vigna radiata* (L.) Wilczek] is an important crop believed to be the origin of Hindustan and Central Asiatic region (Vavilov, 1926). It is widely cultivated throughout the India, Pakistan, Bangladesh, Sri-Lanka, Thailand, Laos, Cambodia, Vietnam, Indonesia, Malaysia, South China and Formosa (Agrawal, 1989).

Mungbean is attacked by many fungal, bacterial, viral and nematodal diseases from seed germination to seed production and maturity. Among these, diseases caused by viruses are major limiting factor since they are difficult to diagnose at the early stage and there are no control measures available to this intriguing plant pathogen. Diseases caused by begomovirus, potyvirus and tospovirus are main viral diseases of mungbean. Yellow mosaic disease (YMD), which is caused by whitefly (*Bemisia tabaci*, Gennadius) transmitted begomovirus, is most important disease among all the viral diseases. This disease is caused by two different species of begomovirus viz., mungbean yellow mosaic virus (MYMV) and mungbean yellow mosaic India virus (MYMIV) (Fauquet *et al.*, 2003).

RESEARCH METHODOLOGY

Occurrence of disease and virus :

Occurrence of the disease in Navsari, Valsad and Surat districts were observed by roving field surveys. Fields were selected randomly and disease was tentatively identified and incidence was observed on the basis of symptoms expressed by the virus. Each field was observed from all the four corners and centre for the assessment of disease incidence and get realistic picture of the spread of the diseases in the field. From each side around 50 plants were selected and infected and healthy plants were counted. Disease incidence (DI) was calculated by the following formula:

$$\text{Disease incidence (DI)} = \frac{\text{Numbers of infected plants}}{\text{Total numbers of the plant observed}} \times 100$$

Representative samples were brought to the Laboratory to confirm the disease by the PCR protocol standardized during the present investigation.

Symptomatology of diseases :

Symptoms of the disease were observed during the field

surveys and after artificially inoculation of the virus by whitefly in controlled conditions. Healthy or un-inoculated plants were used as a control to compare and clearly demark the symptoms.

RESEARCH FINDINGS AND ANALYSIS

The experimental findings obtained from the present study have been discussed in following heads:

Occurrence of YMD in mungbean :

Total 16 fields were visited during the summer 2010. None the field observed was found free from the MYMV disease. Common pattern of disease incidence and spread of MYMV was observed during the survey. Crop at the first trifoliolate leaf stage at N.A.U. farm, Pardi, Puni, Karadi, Matwad and Gandevi villages of Navsari district showed 08-12 per cent incidence (Table 1). The incidence increased with increase in the crop stages. Around 16-20 per cent incidence was observed in second trifoliolate leaf stage at Balwada, Malwada, Godthal and Gangpur villages of Navsari.

Sr.No.	District	Taluka	Village/ location	Area (ha)	Verity	Stage of the crop	Disease incidence (%)
1.	Navsari	Navsari	College farm	1.4	GM-4	First trifoliolate leaf	09.86
			Puni	1.2	GM-4	First trifoliolate leaf	09.98
			Pardi	0.4	K-851	First trifoliolate leaf	10.45
		Jalalpore	Karadi	0.8	K-851	First trifoliolate leaf	08.92
			Matwad	0.6	K-851	First trifoliolate leaf	11.09
			Gandevi	1.0	GM-3	First trifoliolate leaf	10.54
			Balwada	1.2	GM-4	Second trifoliolate leaf	15.38
		Chikhli	Malwada	2.0	K-851	Second trifoliolate leaf	18.62
			Godthal	0.4	K-851	Second trifoliolate leaf	19.50
			Gangpur	1.2	Pusa Vishal	Second trifoliolate leaf	16.23
2.	Surat	Surat	Umara	0.4	GM-0508	Before flowering stage	45.31
		Bardoli	Ayana	1.2	GM-4	Before flowering stage	48.48
		Mahuva	Nalghara	0.2	Pusa Vishal	Before flowering stage	50.21
		Valsad	Kalvada	1.0	GM-3	At flowering stage	70.34
3.	Valsad	Dharampur	Vakal	0.4	GM-4	At flowering stage	65.36
		Bilimora	Rampur	0.4	K-851	At flowering stage	75.75

Verity	Area (ha)	Disease incidence at different stage of crop			
		First trifoliolate	Second trifoliolate	Flowering stage	Maturity stage
K-851	1.74	16	36	58	91
K-851	1.00	18	46	67	100
GM-4	0.80	11	32	52	85
K-851	0.40	14	35	54	90
K-851	0.40	13	30	48	88
GM-4	0.60	10	25	45	82
GM-3	0.60	08	28	40	75

Forty one to 55 per cent incidence was observed at Umara, Ayana and Nalghara villages of Surat district just before the flowering. At the time of flowering, crop showed 65-76 per cent incidence when observed at Kalvada, Vakal and Rampur villages of Valsad district.

Fixed field survey served at the time of first trifoliolate stage showed 8-18 per cent incidence, 25-46 per cent, at the time of flowering 40-67 per cent and at the time of maturity 75-100 per cent incidence (Table 2). K-851, GM-4, and GM-3 varieties of the mungbean were observed and none of the variety showed resistance to the MYMV in the natural condition. Severity of the disease observed in present investigation in accordance with the severity of the disease observed by different scientists (Nariani, 1960; Varma and Malathi, 2003 and Pathak and Jhamaria, 2004) from mungbean and other *Begomovirus* from different crops. Pathak and Jhamaria (2004) observed heavy incidence of the MYMV on different cultivars of mungbean. Severity and incidence vary from varieties to varieties and in susceptible varieties (K-851) which most popular in Rajasthan showed cent pre cent incidence. Most of the Rajasthan varieties were highly susceptible showing more than 75 per cent incidence.

Presently whitefly transmitted yellow mosaic diseases (YMD) is considered to be most serious bottle neck in the production of different pulses. Economic losses due to the disease in mungbean, urdbean and soybean have been estimated to be \$ 300 million (Varma and Malathi, 2003). Begomoviruses are not only the serious problem of the pulses, but also have been observed to cause enormous economic in cassava, cotton, okra, etc. Thresh *et al.* (1997) observed US \$ 1200-2300 million losses due to cassava mosaic virus (CMV) in cassava in African continent. Cotton leaf curl virus (CLCV) caused loses of US \$ 5 billion during year 1992-97 in Pakistan. Mahatma *et al.* (2007) observed 1.2 millions tones fresh fruit losses to the tune of US \$ 134 millions due to okra yellow vein mosaic disease in India in assessment year 2003-04.

Symptomatology of YMD in mungbean :

First trifoliolate typical symptoms of the MYMV infection on mungbean were recorded from to the maturity. The symptoms initiated generally as small scattered yellow to golden yellow colour flecks on the infected trifoliolate. These were scattered on the entire leaves and were more concentrated near the leaf venation. With age, symptoms became brighter and enlarged to some extent; however, depletion of the chlorophyll could not be observed once synthesized. Therefore, severity of the symptoms could be seen in the newly emerging leaves, where in case of high susceptibility cent per cent area of the leaf turned yellow. The symptoms could be observed on all the green colored aerial part of the plants, including stem, petiole, sepal, pods and seeds. Infected plant had few pods of small size and the seeds also yellow

pigmentation. Similar symptoms were observed from the plants inoculated artificially under the controlled conditions. PCR was performed of the representative samples showing different types of symptoms. All the samples showing typical symptoms mentioned in the present symptomatology showed ~ 700 bp specific band of DNA-A molecule of MYMV with the degenerate primers.

Similarly, various workers have also studied on the natural symptoms of MYMV in mungbean field. Nariani (1960) reported the yellow mosaic disease (YMD) produces first symptoms of the disease on the young leaves in the form of mild scattered yellow specks or spots. The next trifoliolate leaf emerging from the growing apex shows irregular yellow and green patches alternating each other. The infected leaves slight puckering and reduction in size and diseased plants usually mature late and bear a very few flowers and pods.

Malathi (2007) reported that the yellow mosaic disease (YMD) infected legumes produces scattered small specks or yellow spots in the leaf lamina, which enlarge to irregular yellow and green patches alternating with each other on matured leaves. The yellow area increase and coalesce resulting in complete yellowing of leaves. The effected plants produce fewer flowers and pods. The size of pods and seeds are reducing considerably. Yellow colour pigmentation and typical symptoms on the seed coat could not be observed any group. During the present investigation typical symptoms of MYMV on seed coat observed.

Conclusion :

Roving field surveys were undertaken in Navsari, Surat and Valsad districts to find out occurrence of the mungbean yellow mosaic virus (MYMV) in the field. Total 16 fields were visited during the summer 2010. None the field observed was found free from the MYMV disease. The MYMV incidence increased with increase in the crop stages. Disease incidence at the first trifoliolate leaf stage was 8-12 per cent, second trifoliolate leaf stage was 16-20 per cent, before flowering stage was 41-55 per cent and at the time of flowering was 65-76 per cent. Fields of Sugarcane Research Station, N.A.U., Navsari farm were observed periodically. Three popular varieties of mungbean *viz.*, K-851, GM-4, GM-3 variety were sown in the field. None of the variety showed resistance against the disease and 75 to 100 per cent incidence was observed at the time of maturity. Among these, K-851 showed cent per cent incidence of the MYMV.

The disease appeared in the field as small scattered yellow to golden yellow colour flecks on the infected leaves. These were scattered on the entire leaves and were more concentrated near the leaf venation. The severity of the symptoms could be seen in the newly emerging leaves, where as in case of high susceptibility cent per cent area of the leaf turned yellow. The symptoms could be observed on all the

green colored aerial part of the plants including cotyledon leaf, trifoliolate leaves, stem, petiole, flower part, pod and seeds. Infected plant remained stunted with few pods of small size and shriveled seed.

LITERATURE CITED

- Agrawal, S.C. (1989).** *Disease of green gram and black gram* International Book Distributer. pp- 1,2,5,159,181,259,28-29,32-33.
- Fauquet, C.M., Bisaro, D.M., Briddon, R.W., Brown, G.K., Harrison, B.D., Rybicki, E.P., Stenger, D.C. and Stanley, J. (2003).** Revision of taxonomy criteria for species demarcation in the family Geminiviridae, and an updated list of begomovirus species. *Archives Virology*, **148**: 405-421.
- Mahatma, Lalit, Mahesh, Sajjan, Naidu, Gopalakrishna, Deshpande, Arvind, Zehr, Usha B. and Ravi, K.S. (2007).** Distribution and yield losses due to Okra Yellow Vein Mosaic Virus in India. 5th International Geminivirus Symposium P1-11, pp. 72.
- Malathi, V.G. (2007).** Genetic identity of Yellow Mosaic Viruses (YMD) infecting legumes and their polygenetic relationship. *Indian Phytopathol.*, **60**(2): 143-155.
- Nariani, T.K. (1960).** Yellow mosaic of mung (*Phaseolus aureus* L.). *Indian Phytopathol.*, **13**: 24-29.
- Nene, Y.L. (1972).** A survey of viral diseases of pulse crops in Uttar Pradesh, 1st Annual Report FG In-358, Project No. A-7, CR-217, Expt. Stn. Project No. 566, Res. Bull. **4**: 6-106.
- Pathak, A.K. and Jhamaria, S.L. (2004).** Evaluation of mungbean (*Vigna radiata* L.) varieties to yellow mosaic virus. *J. Mycol. & Plant Pathol.*, **34**(1): 64-65.
- Thresh, J.M., Otim-Nape, G.W., Legg, J.P. and Fargette, D. (1997).** African cassava mosaic virus disease: the magnitude of the problem. *African J. Root & Tuber Crops* **2**: 13-17.
- Varma, A. and Malathi, V.G. (2003).** Emerging geminivirus problems: A serious threat to crop production. *Ann. Appl. Biol.*, **142**: 145-164.
- Vavilov, M.Z. (1926).** Studies on the origin of cultivated plants. *Chronica Botanica*, **13**: 116.


 ★★★★★OF EXCELLENCE★★★★★