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Yellow mosaic Disease of Mungbean

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Vigna radiata L. Wilczek, often known as Greengram, Moong, mashbean, goldengram, and greensoy (Markam *et al*., 2018) (originated in India or the Indo-Burmese region), is an essential crop cultivated across Asia, Australia, West Indies, South and North America, tropical and subtropical Africa (Karthikeyan *et al*., 2014). India is the leading mungbean producer followed by China and Myanmar (Ramakrishnan Nair *et al*., 2014). It belongs to the family *Fabaceae* and sub-family *Papilonaceae.* It contains large amount of folate and iron and is a great source of dietary proteins (Keatinge *et al*., 2011). It is third in the series of important pulse crop. The standard worldwide yield of mungbean is very low (384 kg/ha) and its production has not increased much (Kang *et al*., 2005).

The low productivity of the crop is due to abiotic and biotic constraints, faulty crop management practices and lack of quality seeds of improved varieties to farmers (Pratap *et al*., 2019). Abiotic stress includes water and salt stress, heat and drought stress. Mungbean is highly sensitive to these stresses, mainly it effects the root production compared to shoot and causes considerable flower drop and reduce pod set (HanumanthaRao *et al*., 2017). Biotic stresses include several pests and diseases. Pests includes white fly, bean thrips, stem fly, Bihar hairy caterpillar among this white fly is major. Diseases includes mungbean yellow mosaic virus, leaf curl virus, anthracnose, powdery mildew, bacterial leaf spot, web blight and cercospora leaf spot (Pandey *et al*., 2018).

Among all these constraints viruses are the most important group that causes severe diseases and affects the production of the crop by dropping off seed quality and yield. Mungbean yellow mosaic disease (MYMD) is an important viral disease of mungbean (Singh *et al*., 2000; Noble *et al*., 2019) caused by several begomoviruses, and are transmitted by whitefly *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) (Nair *et al*., 2017). Depending upon disease severity, susceptibility of cultivars and population of whitefly, yield loss due to this disease may range between 5-100% (Nene, 1972; Singh, 1980; Rathi, 2002).

YMD has been reported throughout the world (except Australia); but its heavy incidence is mainly reported from countries like India, Bangladesh, and Pakistan (Pathak and Jhamaria, 2004; Biswas *et al*., 2008; Salam *et al*., 2011). The virus enters the phloem cells of the host through the whitefly proboscis and the viral aggregates appear in the host cell nuclei roughly two days prior to symptom appearance (Thongmeearkom *et al*., 1981). After 12-16 days post inoculation, appearance of first symptoms occurs on young leaves in the form of scattered yellow specks or spots. Symptoms includes yellowing/chlorosis following necrosis, vein banding (yellow and green), shortening of internodes, stunting of plants, deformed pods with few no. of seeds and shriveled seeds. Severe symptoms of mosaic, yellowing and puckering occurs on the crops infected at an early stage (Salam *et al*., 2011). The virus also causes irregular green and yellow patches in older leaves and complete yellowing of younger

leaves (Nene, 1973). Diseased plants usually mature late. The pods mature late and an early infection often leads to death of plants. The symptoms were found to be systemic.

In India, MYMV was first reported from the mungbean fields of Indian Agricultural Research Institute (IARI), New Delhi during 1950s (Nariani, 1960). In general, MYMV is the major isolate infecting mungbean crop in western and southern India, Thailand, and Indonesia; whereas, MYMIV isolate in central, eastern and northern India, Pakistan, Bangladesh, Nepal, and Vietnam (Malathi and John, 2009).

Disease incidence was found more in kharif as compared to summer season. While considering weather parameters with disease incidence, significant positive correlation was found with relative humidity and rainfall while significant but negative correlation for disease incidence was found with maximum temperature. The most critical periods for maximum disease incidence as per standard meteorological week (SMW), were the 19th (3rd week of May) and 31st (3rd week of August) during summer and kharif seasons, respectively (Suman *et al*., 2016). It was also found that relative humidity played a highly significant role in outbreak of MYMV disease during both the seasons.

Alternate hosts of MYMV are many like *Nicotiana benthamiana*, *Vigna mungo* (Blackgram), *Macrotyloma uniflorum* (Horsegram), *Cajanus cajana* (Pigeonpea), *Glycine max* (Soyabean), *Vigna ungiculata* (Cowpea) and weed hosts viz., *Acalypha indica*, *Malvestrunm coromandelium*, *Croton bonplandianum*, *Euphorbia geniculata*, *Alternenthera sessile* and *Phyllanthus madraspatensis* .These host plants served as potential alternate hosts and major source of virus inoculum for MYMV disease during the off season (Pandey, S. 2018).

So, the best we can do is managing and preventing this disease to spread and acquire severe form. For managing the first thing that comes to my mind is using resistant varieties. There are many varieties recommended for cultivation some are: Samrat, Pant Mung 3, Narendra Mung 1, Sattya, Basanti, MH 421 etc. Intercropping with non-host crops like sorghum, pearl millet and maize will also help in sorting the problem to some extent as these crops are not favoured by whiteflies. Roughing of diseases plants is also recommended and at last we can do chemical spraying to control whiteflies (vector). For that foliar application of metasystox or triazophos 40 EC @ 2.0 ml/l or malathion 50 EC @ 2.0 ml/l or oxydemeton methyl 25 EC @ 2.0 ml/l at 10-15 days intervals is required for effective management of the disease by reducing vector control.

Management of this deadly disease is still the biggest challenge.

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