The Andhra Agric. J 60(2): 366-368, 2013

Evaluation of Mungbean Varieties Against Legume Pod Borer Incidence, Yellow Mosaic and Powdery Mildew Diseases Under Rice Fallows

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ABSTRACT

A field experiment was conducted to screen twelve mungbean varieties for resistance to certain insect pests and diseases and for their suitability under rice fallows at Agricultural Research Station, Ghantasala, Krishna District, Andhra Pradesh during the *rabi* season of 2010. The results indicated that the varieties; Pusa Vishal and Pant M 5 were found to be significantly superior with lower disease infection of mungbean yellow mosaic virus (8.33 and 11.67 per cent respectively) coupled with lower incidence of legume pod borer (15.80 and 22.96 per cent respectively) in pods and produced higher seed yields (882 and 834 kg/ha respectively) compared with other varieties.

Key words : Legume pod borer incidence, Mungbean, MYMV, Powdery mildew.

Mungbean (*Vigna radiata* (L.) Wilczek) is an important pulse crop widely grown in kharif, rabi and summer seasons in India, and is grown in an area of 2.92 million ha, with a production of 1.42 million ton with a productivity of 486 kg ha^{-1} (Dixit, 2005). In canal irrigated areas of Andhra Pradesh, mungbean (*V. radiata*) or urdbean (*Vigna mungo* (L.) Hepper) is cultivated as rice fallow crop which is the most popular cropping system. Whenever, paddy harvestings are delayed, mungbean crop is preferred because of its short duration. In the recent years, incidence of insect pests and diseases has become a major production constraint. Among the diseases, cercospora leaf spot (*C. canescens, C. cruenta*), powdery mildew (*Erysiphe polygoni*) and anthracnose disease (*Colletotrichum spp.*) are the most commonly occurring on mungbean in rice fallow pulses. Besides fungal diseases, the mungbean yellow mosaic virus (MYMV) disease is the most important viral disease transmitted by the whitefly vector (*Bemisia tabaci* Genn.), which causes 30-70 per cent yield loss (Marimuthu *et al.,* 1981). Severity of various diseases is largely influenced by the vector population and prevailed weather conditions during the season. During the cool, dry months; the yield losses owing to severe infection of powdery mildew have been estimated to be around 20-40 per cent (Reddy *et al.,* 1994). Among the insect pests, the legume pod borer, *Maruca vitrata* (Geyer) can inflict yield losses ranging from 20 to 80% (Singh and Allen, 1980). Hence the present study was aimed to identify the mungbean varieties resistant to yellow mosaic virus and powdery mildew diseases with less pod borer incidence and higher yield performance under rice fallows at Agricultural Research Station, Ghantasala, Krishna District, Andhra Pradesh during the rabi season of 2010.

MATERIAL AND METHODS

A total of twelve mungbean cultures obtained from Indian Institute of Pulses Research (IIPR), Kanpur were sown on 23rd December, 2010 in a randomized block design with three replications, each plot measuring 1.8 x 4 m. The trial plot was maintained by adopting normal agronomic practices. The delayed sowing due to heavy rains provided an opportunity to screen the entries under higher selection pressure of diseases and pod borer incidence. The incidence of yellow mosaic and powdery mildew diseases was recorded at 55 days after sowing as per cent infection (Alice and Nadarajan, 2007). The percent incidence (PI) was calculated by using the following formula.

$$\text{Percent incidence} = \frac{\text{No. of plants infected in a row}}{\text{Total no. of plants in a row}} \times 100$$

While, the pod damage due to legume pod borer was recorded at the time of harvest. Seed yield from each plot was recorded and worked out per hectare. The data were subjected to statistical analysis after transforming the values and presented in Table 1.

Table 1. Reaction of mungbean varieties to pod borer incidence, yellow mosaic and powdery mildew diseases and their yield performance during *rabi*, 2010-11.

S. No.	Variety	Pod damage (%) due to pod borer	Yellow mosaic disease (%)	Powdery mildew infection (%)	Seed yield (kg/ha)
1	ML 1299	24.67 (29.62)	1.67 (4.31)	13.33 (21.34)	263
2	RMG 492	31.95 (34.38)	53.33 (46.92)	8.33 (16.21)	104
3	Pusa 9531	31.22 (33.78)	15.00 (22.60)	28.33 (32.14)	618
4	IPM 02-14	30.42 (33.30)	1.67 (4.31)	20.00 (26.07)	377
5	Pant M 5	22.96 (28.41)	11.67 (19.89)	26.67 (30.94)	834
6	SML 668	24.80 (29.80)	16.67 (24.05)	36.67 (37.22)	707
7	IPM 02-3	24.86 (29.73)	0.00 (0.0)	38.33 (38.08)	573
8	COGG 912	28.07 (31.96)	15.00 (22.60)	23.33 (28.29)	438
9	KM 2241	34.87 (36.11)	8.33 (16.60)	20.00 (26.45)	629
10	TM 96-2	27.35 (31.37)	25.00 (29.92)	0.00 (0.0)	427
11	TARM 1	36.13 (36.92)	25.00 (30.00)	0.00 (0.0)	355
12	Pusa Vishal	15.80 (23.14)	8.33 (16.60)	30.00 (32.76)	882
	SEm±	2.40	2.53	2.87	34.9
	C. D.	7.03	7.41	8.42	102.5

RESULTS AND DISCUSSION

There were significant differences in the degree of tolerance to the pod borer incidence and diseases; and in the yield performance among the varieties tested. The data revealed that the per cent pod damage due to legume pod borer was ranged from 15.80 in Pusa Vishal to 36.13 in TARM 1 (Table 1). The entry; Pusa Vishal was found to be significantly superior with the lowest pod damage (15.80 per cent) and remained at par with Pant M 5 (22.96 per cent), ML 1299 (24.67 per cent), SML 668 (24.80 per cent) and IPM 02-3 (24.86 per cent). The variety, IPM 02-3 was completely free from yellow mosaic disease infection, while RMG 492 (53.33 per cent) was the most severely affected. The entries; IPM 02-3 (0.0 per cent), IPM 2-14 (1.67 per cent) and ML 1299 (1.67 per cent) were found to be resistant to yellow mosaic virus and significantly superior to other entries. The entries; Pusa Vishal (8.33 per cent), KM 2241 (8.33 per cent), Pant M 5 (11.67 per cent), Pusa 9531 (15.00 per cent) and COGG 912 (15.00 per cent) were also found to be moderately resistant to yellow mosaic virus. Lakshminarayan *et al*., (2008) indicated that the leaflet area and trichome length were responsible in exhibiting greengram susceptibility/ resistance to YMV infection. With reference to the powdery mildew disease, the varieties namely; TM 96-2 and TARM 1 showed highly resistant reaction with zero infection, while IPM 02-3 (38.33 per cent) showed moderately susceptible reaction with the highest disease infection among the varieties. Highest seed yield was realized from the entry, Pusa Vishal (882 kg ha^{-1}) which remained at par with Pant M 5 (834 kg ha^{-1}) and they were found significantly superior to the other varieties. RMG 492 (104 kg ha^{-1}) recorded the lowest yield. Although Pusa Vishal was moderately susceptible to powdery mildew disease (30.00 per cent), it was moderately resistant to yellow mosaic disease (8.33 per cent) and legume pod borer incidence (15.80 per cent) and realized the highest yield (882 kg ha^{-1}).

The data revealed a negative association between yellow mosaic disease resistance and powdery mildew disease resistance among the twelve varieties evaluated. The varieties; TM 96-2 and TARM 1, which showed highly resistant reaction with zero infection of powdery mildew disease, were in turn found moderately susceptible to yellow mosaic disease (25.00 per cent each). Similarly, RMG 492 variety, which is susceptible to yellow mosaic disease with 53.33 per cent infection showed moderately resistant reaction to powdery mildew disease (8.33 per cent). In contrast, Mandhare and Suryawanshi, (2008) identified some mungbean genotypes namely; Vaibhav, BPMR 145, TARM 18, Phule M 2003-3, Phule M 2002-13, Phule M 2002-

17, Phule M 2001-3 and Phule M 2001-5 having combined resistance against powdery mildew and yellow mosaic virus. From the data, it is further observed that the YMV tolerance coupled with less incidence of pod borer had reflected in higher yields in Pusa Vishal (882 kg ha^{-1}) and Pant M 5 (834 kg ha^{-1}).

The varieties; Pusa Vishal and Pant M 5 emerged as superior, producing significantly higher seed yields, 882 and 834 kg ha^{-1} with lower disease infection of YMV (8.33 and 11.67 per cent respectively) and lower pod damage (15.80 and 22.96 per cent) compared with other varieties. The varieties; TM 96-2 and TARM 1 which were highly resistant to powdery mildew, can be utilized as donors in breeding programmes. Plant characters such as open canopy, long peduncles, erect pods with wide angles, profuse flowering, pod size, and rate of pod growth can be used to select for resistance to *M. vitrata* (Sharma, 1998). The development of varieties by incorporation of MYMV and powdery mildew resistant genes into commercially acceptable cultivars is an effective strategy to control these diseases. The constraints involved in the identification of resistant lines through conventional breeding can be over come through indirect selection using molecular markers linked to MYMV and powdery mildew resistant genes and high throughput marker assisted selection (MAS) of resistant genotypes.

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(Received on 26.09.2011 and revised on 04.04.2012)