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SOURCES OF RESISTANCE TO WILT AND YMV IN HORSE GRAM

K Kanaka Durga, V Sandeep Varma and A Vishnu Vardhan Reddy

Seed Research and Technology Centre,
ANGRAU, Hyderabad, 500030, AP,
India.

Abstract

Studies on the relative resistance of Horse gram (*Macrotyloma uniflorum*) accessions to wilt and yellow vein mosaic virus was undertaken at Seed Research and Technology Centre, ANGRAU, Rajendranagar, Hyderabad, during rabi, 2010-11. 23 horse gram accessions collected from RARS, Palem with different seed coat colours were screened for their relative response to the attack of YMV and incidence of wilt disease. The wilt incidence was more in straw coloured (1.95 %) accessions followed by black coloured (1.89 %) and light straw (1.43 %) coloured accessions and are significantly different. Among the black coloured accessions, HG 75 recorded highest wilt incidence i.e. 3.8 % followed by HG 54 (3.45 %) and were found to be highly susceptible. Among all 23 horse gram cultivars, HG 15 is highly susceptible to wilt incidence as it was recorded highest wilt incidence percentage (4.9 %) and HG 38 was highly resistant to wilt as it recorded only 0.35 % percentage in field conditions. With respect to YMV incidence, straw coloured accessions were highly resistant (0.55 %) followed by light straw coloured (1.19 %) and black coloured (2.52 %) accessions. HG 35 showed highest incidence of YMV with 3.93 % while HG 46, HG 59, HG 18, HG 72, HG 11, AK 38 and HG 14 showed less incidence and are highly resistant to YMV. The accessions HG 52, 46, 59, 18, 24, 17, 11, 38, 14 and AK 38 were found to be highly resistant to both wilt and YMV incidence. Although HG 63, 58, 50 and Palem 2 were highly resistant to wilt incidence, they also showed resistant reaction to YMV. Some accessions like HG 54, 72, and HG 49 exhibited high resistance to YMV and resistance reaction to wilt incidence.

Key words: Resistance, Horsegram, wilt, YMV, accessions.

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INTRODUCTION

Horse gram, *Macrotyloma uniflorum* (Lam verdc.) is one of the most important unexploited food legumes being cultivated in almost all over the world including temperate and sub-tropical regions. The crop faces various problems throughout the growing areas, some related to specific regions and some under wider range of climatic conditions. Among biotic stresses, yellow vein mosaic virus and dry root rot and wilt caused by *Macrophomina phaseolina* are the most serious diseases in India. The yellow vein mosaic virus disease damages the plant by reducing the leaf area available for photosynthesis and by stimulating leaflet abscission leading to heavy defoliation (McDonald et al., 1985). With respect to wilt, severely infected seedlings or young plants may be killed or break off at the infected and weakened portions of the hypocotyl. Lesions also can develop on pods in contact with the moist soil surface, and cause pod rotting and seed discoloration (Schwartz et. al. 2011). Although the foliar diseases can be controlled by spraying certain fungicides (Smith and Littrell, 1980) but they are costly and not readily available to the small scale farmers of the semiarid tropics (Gibbons 1980). Among different approaches of disease management, growing of resistant variety is the best environment friendly means of reducing yield loss from these diseases (Gibbons, 1980 and Subrahmanyam et.al. 1995). Host resistance is the fundamental constituent for disease management in plants. Performance of resistance cultivars is better than cultivars with low disease resistance particularly in favourable environmental conditions for disease development. Therefore, it is important to identify sources of resistance that can be used to evolve resistant variety. A little information is available on germplasm evaluated for dual resistance against these two important diseases due to their occurrence under contrasting environments. The present study was therefore, undertaken with the hypothesis to identify accessions of horse gram for resistance against both of these diseases from diverse genetic resources.

MATERIALS AND METHODS:

Twenty three cultivars of horse gram with different seed coat colours were evaluated during *Rabi*, 2010-11 for relative resistance/susceptibility against yellow vein mosaic virus and wilt at Seed Research and Technology Centre, Acharya N G Ranga Agricultural University, Rajendranagar, Hyderabad. Twenty three horse gram accessions collected from RARS, Palem were sown in a randomised block design with three replications. The plot size is 4.8 m^2 with a spacing of 30 x 10 cm. All the recommended agronomic practices were followed to raise a healthy crop. Total number of plants affected with YMV and wilt were recorded separately in each accessions and % of wilt/YMV affected plants was calculated as follows:

$$\%\ \text{wilt(or)YMV incedence} = \frac{\text{Number of plants affected with wilt (or)YMV}}{\text{Total number of plants}} \text{X } 100$$

RESULTS AND DISCUSSION:

Wilt incidence:

Wilt incidence among twenty three accessions of horse gram ranged from 0.35 to 4.9. In black seeded group, it range from 0.95 to 3.8, in straw coloured accessions, 0.35 to 4.9 and in light straw coloured accessions, it was ranged from 1.35 to 1.6. All of the accessions except HG 15 showed resistance to wilt disease in horse gram. Out of the 23 accessions screened, only six accessions i.e. HG 75, HG 54, HG 72, HG 41, HG 49 and Palem 1showed resistance where as sixteen accessions i.e. HG 63, HG 58, HG 35, HG 50, HG 52, HG 46, HG 59, HG 18, HG 24, HG 17, HG 11, HG 38, HG 14, HG 32, Palem 2 and AK 38 showed high resistance to wilt disease in horse gram. It is interesting to note that all the three light straw coloured accessions showed highly resistance reaction to the wilt disease. This suggests that sucesptibility may not be a function of seed coat colour but of other internal mechanisms that might interact with the pigmentataion process, level ofwater imbibition by the seeds, speed of emergence and level of root exudation (Lucas and Griffiths, 2004). A major proportion of black coloured accessions (66.67 %) showed high resistance where as only 33.33 % were resistant to wilt (Table 1). The resistance expressed by the seeds of cowpea, may be attributable to the presence of phenols, tannins and/or lignin's in the seed coat. Darkly pigmented seed coat contains more tannins and lignins than unpigmented seeds (Morrison et.al., 1995).

The mean wilt incidence was more in straw coloured (1.95 %) accessions followed by black coloured (1.89 %) and light straw (1.43 %) coloured accessions and are significantly different. Among black coloured accessions, HG 50 and HG 46 showed high resistance to wilt disease by recording very less per cent of wilt incidence i.e. 0.95 % and HG 75 was highly susceptible to wilt disease (3.8 %). With respect to straw coloured accessions, HG 38 was highly resistant and recorded very low wilt incidence (0.35%) while HG 15 (4.9 %) was highly susceptible to wilt disease. Out of the three accessions from light straw group, HG 14 and HG 32 (1.35 %) showed high resistance towards wilt disease and Palem 2 (1.6 %) showed low resistance to wilt incidence in horse gram (Table 2).

YMV incidence

Only HG 35 was susceptible to yellow vein mosaic virus among all the other 23 horse gram accessions. Straw coloured accessions were highly resistant (0.55 %) followed by light straw coloured (1.19 %) and black coloured (2.52 %) accessions. Irrespective of seed coat colour, seven accessions namely HG 46, HG 59, HG 18, HG 72, HG 11, HG 14 and AK 38 were highly resistant to yellow vein mosaic virus, where as HG 35 (3.95 %) and HG 58 (2.96 %) were highly susceptible to the YMV disease incidence in horse gram. Among highly pigmented seeds i.e. black seeded accessions, HG 46 (0.00 %) showed no symptoms of YMV incidence and could be considered highly resistant. At the same time, HG 35 (3.93 %) was highly susceptible to attack of yellow vein mosaic virus. With respect to straw coloured accessions, out of 11 accessions, five accessions i.e. HG 59, HG 18, HG 72, HG 11 and AK 38 were highly resistant to YMV disease as there was no symptoms of yellow vein mosaic virus on these accessions. HG 14 (0.00 %), the only light straw coloured accession showed high resistance with no symptoms of virus, where as HG 32 (1.59 %) and Palem 2 (2.00 %) showed resistance to yellow vein mosaic virus (Table 2).

Among all the 23 accessions, 14 accessions i.e. HG 54, HG 52, HG 46, HG 59, HG 18, HG 24, HG 17, HG 72, HG 11, HG 38, HG 15, HG 49, HG 14 and AK 38 were highly resistant to yellow vein mosaic as they recorded very less incidence of disease in the range of 0.00 % to 1.49 % only. The

horse gram accessions, HG 75, HG 63, HG 58, HG 50, HG 41, HG 32, Palem1 and Palem 2 were found to be moderately resistant to yellow vein mosaic virus disease. Among straw coloured accessions, about 90.90 % of the accessions were highly resistant to YMV disease where as only negligible proportion, 9.09 % accessions were found to be resistant to the attack of yellow vein mosaic virus. On the other hand, high proportion of black seeded accessions (55.55 %) and light coloured accessions (66.67 %) were resistant to YMV disease in horse gram (Table 1).

From the figure 1, it is observed that among all the 23 accessions of horse gram, six accessions i.e. HG 63, HG 58, HG 35, HG 50, HG 32 and Palem 2 were highly resistant to wilt disease incidence, where as four accessions, HG 54, HG 72, HG 15 and HG 49 were highly resistant to yellow vein mosaic virus disease incidence. The ten accessions namely HG 52, HG 46, HG 59, HG 18, HG 24, HG 17, HG 14, HG 11, HG 38 and AK 38 were highly resistant to both the serious diseases of horse gram i.e. wilt and YMV.

HG 35 showed highest incidence of YMV with 3.93 % while HG 46, HG 59, HG 18, HG 72, HG 11, AK 38 and HG 14 showed no incidence and are highly resistant to YMV. Although HG 63, 58, 50 and Palem 2 were highly resistant to wilt incidence, they also showed resistance to YMV. Some accessions like HG 54, 72, and HG 49 were high resistant to YMV and resistant to wilt incidence.

Table 1: Frequency distribution of horse gram accessions for % wilt and YMV incidence

Class	**Number of accessions**			**Total**	**Rank**	**Accessions**
	Black	**Straw**	**Light straw**			
% Wilt incidence						
Less than 2	6 (66.67%)	7 (63.63 %)	3 (100 %)	**16**	Highly resistant	HG 63, 58, 35, 50, 52, 46, 59,18,24,17,11, 38, 14, 32, Palem 2, AK 38
2-4	3 (33.33%)	3 (27.27 %)	0	**6**	Resistant	HG 75, 54, 72, 41, 49, Palem 1
More than 4	0	1 (9.09 %)	0	**1**	Susceptible	HG 15
% YMV incidence						
0.00 to 1.49	3 (33.33 %)	10 (90.90 %)	1 (33.33 %)	**14**	Highly resistant	HG 54, 52, 46, 59, 18, 24, 17, 72, 11, 38, 15, 49, 14, AK 38
1.50 to 2.99	5 (55.55 %)	1 (9.09 %)	2 (66.67 %)	**8**	Resistant	HG 75, 63, 58, 50, 41, 32, Palem1 , 2
3.00 to 4.49	1 (11.11 %)	0	0	**1**	Susceptible	HG 35

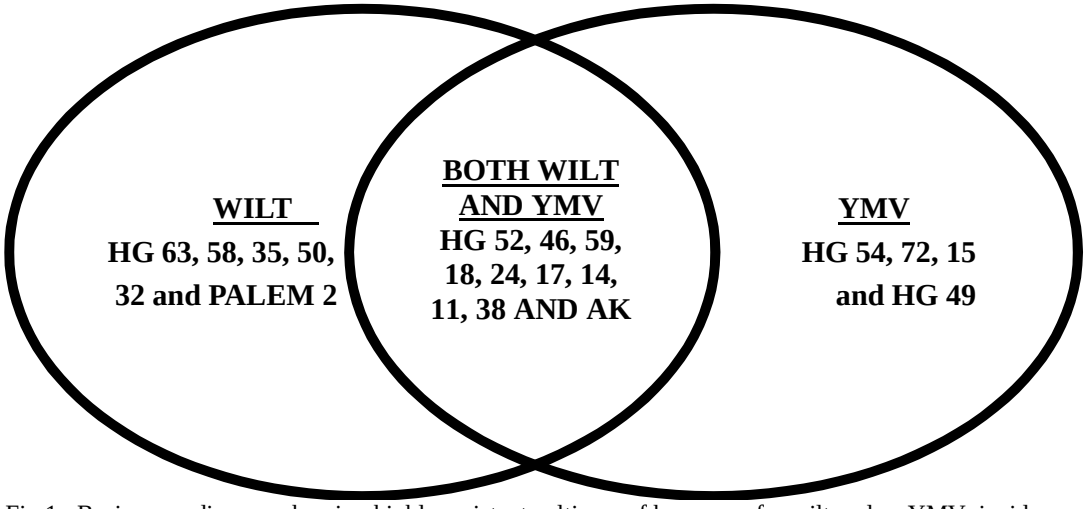

Fig 1: Basic venn diagram showing highly resistant cultivars of horegram for wilt and YMV incidence

Table 2: % incidence of wilt and YMV for different horse gram varieties

S.No	Treatment	Seed	% Wilt	% YMV
1	HG 75	Black	3.8	2.19
2	HG 54	Black	3.45	0.69
3	HG 63	Black	1.25	1.92
4	HG 58	Black	1.55	2.96
5	HG 35	Black	1.85	3.93
6	HG 50	Black	0.95	2.61
7	HG 52	Black	1.05	0.74
8	HG 46	Black	0.95	0.00
9	Palem 1	Black	2.2	2.68
	Mean		**1.89**	**2.52**
	Range		**0.95 to 3.8**	**0.00 to 3.93**
10	HG 59	Straw	1.3	0.00
11	HG 18	Straw	0.85	0.00
12	HG 24	Straw	1.2	0.72
13	HG 17	Straw	1.4	0.76
14	HG 72	Straw	3.4	0.00
15	HG 11	Straw	1.5	0.00
16	HG 38	Straw	0.35	0.71
17	HG 41	Straw	2.1	2.56
18	HG 15	Straw	4.9	0.71
19	HG 49	Straw	3.5	0.61
20	AK 38	Straw	0.95	0.00
	Mean		**1.95**	**0.55**
	Range		**0.35 to 4.9**	**0.00 to 2.56**
21	HG 14	Light straw	1.35	0.00
22	HG 32	Light straw	1.35	1.59
23	Palem 2	Light straw	1.6	2.00
	Mean		**1.43**	**1.19**
	Range		**1.35 to 1.6**	**0.0 to 2.00**
	General Range		**0.35 to 4.9**	**0.00 to3.93**

CONCLUSION

The resistant accessions identifies can be use as parents in the hybridization programme for developing wilt/ YMV resistant varieties.

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