Effect of Yellow Mosaic Virus on Seed Yield of Horse Gram (*Macrotyloma uniflorum*) Pedigrees Under Rainfed Alfisols

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ABSTRACT

A study was made to assess the effect of yellow mosaic virus (YMV) on 18 mutated pedigrees of horse gram grown under rainfed alfisols. The assessment was based on descriptive statistics of pedigrees along with the estimates of correlation computed between the incidence of YMV and harvested seed yield with the data of field experiments on horse gram conducted during late *kharif* 1995 and 1997. Analysis of variance indicated a significant difference among pedigrees in both seasons. Graphical analysis had also been made to show the effect of YMV on seed yield in pedigrees. The study indicated the superiority of 2-R, 7-R, 8-R and 9-R pedigrees which had a higher seed yield with lower incidence of YMV in both seasons. Further, these four pedigrees were found to have a lower standard deviation which indicated that they were more stable and consistent in their performance in both seasons.

Key words : Correlation analysis, Horse gram, Seed yield, Yellow mosaic virus

Horse gram, *Macrotyloma uniforum* is one of the unexploited pulse crop grown under drylands in India. There are no suitable pedigrees which could provide high grain yield and biomass under rainfed conditions. An early maturing and high yielding pedigree is very much desired for dryland alfisols. Further, the crop is usually affected by a yellow mosaic virus which would greatly reduce the yield. The performance of pedigrees would vary, depend on the amount and distribution of rainfall and effects of different weather variables. The crop, if exploited properly, could help in reducing the dependence on the major pulses which are not only costly but are also less in supply. A great need is required to increase the productivity and stabilise the yields of horse gram (Sahaul *et al.*, 1995; Samal & Senapati, 1997) by exploring suitable pedigrees which are resistant to both biotic and abiotic stresses under rainfed conditions. There is a need to develop suitbale resistant pedigrees of horse gram to YMV and provide higher seed yield under rainfed conditions of research, farms and farmers fields. A detailed study is made in this paper to identify resistant pedigrees of horse gram to YMV which also would provide higher seed yield based on the field experiments.

Materials and Methods

Two field trials with 18 mutated (Gamma rays and EMS) pedigrees of horse gram were conducted during the late *kharif* 1995 and 1997. The pedigrees evaluated were 1-B, 1-R, 2-R, 3-A, 3-R, 4-R, 4-B, 5-A, 6-R, 7-R, 8-R, 9-R, 10-R, 11-B, 12-B, 13-B and 14-B in a RBD with three replications. Each replication had 6 rows of each of the 18 pedigrees. Normal agronomic and plant protection measures were adopted for raising a good crop. There was an attack of yellow mosaic virus in both the seasons. Observations were recorded on the incidence of YMV (%) and the harvest seed yield (g/plant) for each pedigree under each replication. Analysis of variance indicated a significant difference among pedigrees for both incidence of YMV and harvested seed yield in both seasons. The performance of pedigrees based on ranks assigned for YMV and seed yield was categorised.

Descriptive statistics *viz.*, range, mean, standard deviation and coefficient of variation (%) have been derived over seasons to understand the performance of pedigrees and make an objective assessment.

Results and Discussion

YMV ranged between 7.59 and 10.66% in 1995; 27.87 and 75.00% in 1997 (Table 1). The harvested seed yields ranged between 5.93 and 11.93 g/plant in 1995 and 1.67 and 4.12 g/plant in 1997 in the study. The virus incidence was found to be more in 1997 than in 1995. Accordingly, the seed yields were higher in 1995 than in 1997. The coefficient of variation (%) in the occurrence of yellow mosaic virus was found to be 9.45% and 23.27% in 1995 and 1997 respectively. Similarly, the coefficient of variation in seed yield was found to be 13.63% in 1995 and 19.35% in 1997. Estimates of correlation between yellow moaic virus and seed yield were derived for each pedigree to assess the effect of the virus on pedigree performance in each season. Ranks had also been provided to assess the

Table 1. Incidence of yellow mosaic virus and harvested seed yield of Horse gram pedigrees under rainfed alfisols

Pedigrees	1995				1997			
	YMV	Rank	Seed yield	Rank	YMV	Rank	Seed yield	Rank
1-B	9.17	14	8.20	17	27.87	1	2.33	16
1-R	10.53	17	11.93	1	33.25	2	2.62	13
2-R	8.23	5	10.07	5	47.62	10	3.51	2
3-A	8.49	8	9.67	7	41.12	4	2.46	15
3-R	9.72	16	9.00	10	44.50	8	2.21	17
4-R	7.59	1	8.87	12	58.00	15	1.67	18
4-V	8.34	6	8.47	15	56.75	14	3.19	6
5-A	8.59	9	5.93	18	42.37	6	3.16	7
6-R	9.03	13	10.00	6	54.75	13	3.51	3
7-R	9.02	12	10.20	4	49.87	11	3.01	9
8-B	7.89	2	8.93	11	75.00	18	4.12	1
8-R	8.08	3	10.33	3	41.25	5	3.30	4
9-R	8.62	10	9.48	8	44.12	7	3.9	8
10-R	8.68	11	8.67	13	51.87	12	2.52	14
11-B	10.66	18	10.53	2	58.12	16	2.79	12
12-B	8.16	4	9.13	9	65.00	17	3.20	5
13-B	9.21	15	8.53	14	45.33	9	2.88	11
14-B	8.47	7	8.40	16	40.62	3	3.00	10
Minimum	7.59		5.93		27.87		1.67	
Maximum	10.66		11.93		75.00		4.12	
Mean	8.80		9.24		48.75		2.92	
S.D.	0.83		1.26		11.34		0.57	
CV (%)	9.45		13.63		23.27		19.35	
SEm±	0.20		0.30		2.67		0.13	
CD (P=0.01)	0.52		0.77		6.89		0.34	

Table 2. Descriptive statistics of yellow mosaic virus and seed yield in Horse gram pedigrees

Pedigrees	Yellow mosaic virus(%)				Seed yield (g/plant)				Correlation between
	Range	Mean	SD	CV(%)	Range	Mean	SD	CV(%)	YMV & SY
1-B	8.16-31.75	18.52	10.55	56.9	1.93-10.00	5.27	3.41	64.7	0.93**
1-R	9.09-33.75	21.89	12.50	57.1	2.22-15.00	7.28	5.38	73.9	0.95**
2-R	7.40-50.00	27.93	21.64	77.5	3.26-12.00	6.79	3.81	66.2	0.93**
3-A	7.89-44.75	24.81	18.03	72.7	2.09-10.80	6.06	4.01	66.1	0.98**
3-R	8.33-52.25	27.11	19.73	72.8	2.05-9.40	5.60	3.73	66.6	0.95**
4-R	4.86-61.75	32.79	27.76	84.6	1.13-11.20	5.27	4.45	84.4	0.86**
4-B	7.69-68.75	32.54	27.58	84.8	2.83-13.20	5.83	3.90	66.9	0.73*
5-A	8.06-45.25	25.48	18.60	73.0	3.13-9.00	4.55	2.32	51.0	0.66
6-R	7.25-56.00	31.89	25.14	78.8	3.18-10.60	6.76	3.60	53.4	0.99**
7-R	8.33-54.50	29.44	22.57	76.7	2.75-11.20	6.61	3.98	60.3	0.98**
8-B	7.40-75.00	41.44	36.76	88.7	3.98-11.00	6.53	2.87	43.9	0.92**
8-R	7.14-42.50	24.67	18.19	73.7	2.79-13.00	6.81	4.13	60.6	0.93**
9-R	7.89-46.00	26.70	19.49	73.9	3.06-9.84	6.29	3.51	55.8	0.99**
10-R	7.30-53.75	30.28	23.74	78.4	2.49-13.00	5.59	4.20	75.1	0.82**
11-B	9.09-70.00	34.39	27.08	78.7	2.68-15.60	6.66	5.08	76.2	0.81*
12-B	7.69-66.75	36.58	31.15	85.2	2.98-12.80	6.17	.14	67.1	0.79*
13-B	7.89-45.50	27.27	19.82	72.7	2.68-9.40	5.71	3.24	56.8	0.97**
14-B	7.87-43.75	24.55	17.73	72.2	2.83-9.00	5.70	2.98	52.3	0.98**

* and ** indicate significance (P=0.05) and (P=0.01), respectively

performance of pedigrees for seed yield when the crop was damaged due to yellow mosaic virus. The different statistics would provide scope to assess the consistency of pedigrees in different seasons. Based on the study, a pedigree which was resistant for YMV and had provided higher seed yield, could be selected for further use under rainfed alfisols.

The incidence of yellow mosaic virus was lowest in the pedigree 4-R with 7.59% and highest in 11-B with 10.66% in 1995. Similarly, the incidence was lowest in 1-B with 27.87% and highest in 8-B with 75% in 1997. The pedigree 5-A had the lowest seed yield of 5.93 g/plant while 1-R had the highest seed yield of 11.93 g/ plant in 1995. Similarly, the pedigree 4-R had the lowest seed yield of 1.67 g/plant while 8-B had the highest seed yield of 4.12 g/plant in 1997. The coefficient of variation in YMV was found to be 9.45% in 1995 and 23.27 in 1997 in different pedigrees. Similarly, the coefficient of variation in seed yield was found to be 13.63% in 1995 and 19.35 in 1997 in different pedigrees. There was a higher intensity of YMV in 1997 than 1995 and accordingly the seed yields were affected. The incidence of yellow mosaic virus was found to be lower than the average incidence of 8.80% in 11 pedigrees *viz.*, 2-R, 3-A, 4-R, 4-B, 5-A, 8-B, 8-R, 9-R, 10-R, 12-B and 14-B in 1995. Similarly, the incidence of virus was found to be lower than the average incidence of 48.75% in 10 pedigrees *viz.*, 1-B, 1-R, 2-R, 3-A, 3-R, 5-A, 8-R, 9-R, 13-B and 14-B in 1997. The seed yield was found to be more than the average seed yield of 9.24 g/plant in 10 pedigrees *viz.*, 1-B, 3-R, 4-R, 4-B, 5-A, 8-B, 10-R, 12-B, 13-B and 14-B in 1995. Similarly, the seed yield was found to be more than the average seed yield of 2.92 g/plant

in 10 pedigrees *viz.*, 2-R, 4-B, 5-A, 6-R, 7-R, 8-B, 8-R, 9-R, 12-B and 14-b in 1997.

The estimates of correlation between YMV and seed yield had been derived for each pedigree. The correlation was significant and negative between YMV and seed yield. The estimates of correlation were found to range between 0.53* (4-B) and 0.99** (6-R and 9-R pedigrees). There was a non-significant correlation of 0.43 between virus and seed yield in 5-A pedigree (Fig. 1 for 1995) and (Fig. 2 for 1997 season). The graphical plots had clearly indicated the superiority of 2-R, 3-A, 6-R, 7-R, 8-R and 9-R pedigrees in 1995 and 2-R, 5-A, 7-R, 8-R, 9-R and 14-B pedigrees in 1997 which had a higher seed yield with a lower incidence of YMV during 1995 and 1997. Thus, the 4 common pedigrees in the two seasons *viz.* 2-R, 7-R, 8-R and 9-R were more consistent and stable than the remaining 14 pedigrees studied.

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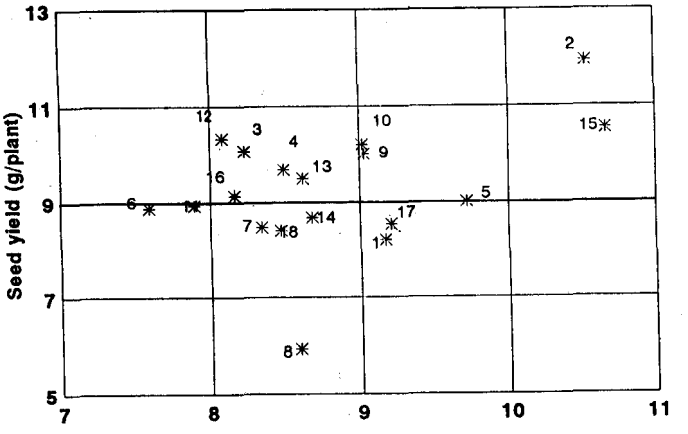

Fig. 1. Relation between yellow mosaic virus and seed yield in 18 pedigrees of horse gram in 1995

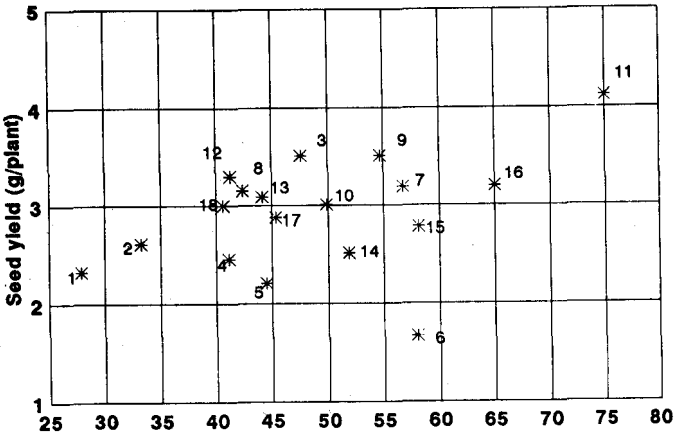

Fig. 2. Relation between yellow mosaic virus and seed yield in 18 pedigrees of horse gram in 1997

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