GROWTH RESPONSES OF URDBEAN CULTIVARS TO YELLOW MOSAIC VIRUS INFECTION

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The growth responses of ten genetically different urdbean cultivars to yellow mosaic virus infection revealed that the virus may affect both the vegetative growth and the yield components. Various urdbean cultivars exhibited 21.62 to 39.81% decrease in plant height, 25.81 to 55.63% decrease in number of branches, 21.85 to 59.70% decrease in number of leaves and 45.52 to 84.12% decrease in dry stem weight. Similarly, the urdbean cultivars suffered from 43.08 to 82.5% decrease in number of pods plant^{-1}, 25.32 to 37.00% decrease in pod size, 22.73 to 30.55% decrease in number of seeds per pod, 30.55 to 57.40% decrease in 100-seed weight and 29.29 to 77.56% decrease in plant yield.

INTRODUCTION

Mashbean or black gram *(Vigna mungo* (L.) Hepper) is one of the most important conventional pulse crops and in Pakistan it is successfully cultivated during summer as well as spring seasons. Although the crop is affected by various pathogens and pests yet yellow mosaic virus (YMV) disease is the most destructive (Ahmad, 1975). This disease has been reported to be transmitted by an insect vector, *Bemisia tabaci* and not by seed, soil, dodder or by mechanical inoculation (Nair and Nene, 1973; Ahmed and Harwood (1973). Since the effect of the disease may vary with cultivar to cultivar and is subject to the genetic make up of the cultivar, this paper reports the results on the quantitative determination of the effect of YMV disease on the vegetative and yield components of ten urdbean cultivars.

MATERIALS AND METHODS

The urdbean cultivars (AARI M 13, AARI M 63, AARI M 66, AARI M 68, AARI M 114, AARI M 121, AARI M 154, AARI M 191, AARI M 6B and Mash 88) obtained from Pulses Section, Ayub Agriculture Research Station, Faisalabad, and exhibiting differential response to YMV infection, were sown, each in two subplots of 2 rows each with row length 4 m, row spacing 30 cm, plant spacing 10 cm and plot to plot distance 60 cm. Out of the two plots for each of cultivars, one was protected from the vectors invasion and hence from virus infection by spraying Tamaran @ 0.2% dilution applied 3 times at 15 days interval starting from 15th day of sowing. The second plot of each cultivar was subjected to natural invasion of vectors and hence to natural infection by YMV. At physiological maturity, sixteen plants, four from each of the four replications, from insecticide protected (healthy) and unprotected (diseased) plots of each cultivars were randomly selected and uprooted. The healthy and diseased plants were tagged and brought to the laboratory. The response of vegetative and reproductive components of urdbean was quantitatively assessed by recording the data on plant height, number of branches and number of leaves/plant, dry

Table 1. Effect of yellow mosaic virus (YMV) on growth parameters of urdbean

Cultivars	Mean plant height			Number of branches			Number of leaves			Plant dry stem weight		
	Healthy plant	Diseased plant	Per cent decrease	Healthy plant	Diseased plant	Per cent decrease	Healthy plant	Diseased plant	Per cent decrease	Healthy plant	Diseased plant	Per cent decrease
AARI M 13	46.5 ab*	34.19 ef*	26.47	7.33 c*	5.06 be*	30.97	10.96 cde*	8.75 def*	20.16	7.33 de*	2.72 ghij*	62.89
AARI M 63	44.06 abc	33.56 ef	23.83	10.15 a	7.53 bc	25.81	14.60 b	12.31 bc	15.68	6.81 e	3.71 fg	45.52
AARI M 66	42.06 bcd	31.25 ef	25.70	10.49 a	6.88 c	34.41	11.25 cde	8.00 fg	28.88	8.29 bcd	1.62 jk	80.46
AARI M 68	48.88 ab	29.70 efg	39.24	10.25 a	5.04 de	50.83	11.94 bc	5.77 gh	51.68	8.31 bcd	2.26 hijk	72.80
AARI M 114	42.50 bcd	33.31 ef	21.62	8.88 ab	3.94 ef	55.63	12.88 bc	5.19 h	59.70	7.44 cde	2.62 ghij	64.78
AARI M 121	51.44 a	36.19 de	29.65	10.00 a	6.2 cd	38.00	17.40 a	12.13 bc	30.29	9.92 a	3.91 f	60.58
AARI M 154	37.00 cde	23.00 gh	37.84	6.69 c	3.38 f	49.48	8.94 def	5.19 h	41.95	8.69 a	1.38 k	84.12
AARI M 191	27.00 fg	16.25 h	39.81	6.94 c	3.48 f	49.86	9.06 def	7.08 fgh	21.85	7.28 de	1.73 ijk	76.24
AARI M 6B	48.13 ab	33.19 ef	31.04	9.75 a	6.56 cd	32.72	9.00 def	4.56 h	49.33	8.92 ab	3.36 fgh	62.33
Mash 88	42.13 bcd	32.38 ef	23.14	8.94 ab	6.25 cd	30.09	11.38 cd	8.50 ef	25.31	8.53 bc	2.88 fghi	56.50

* = Any two means having same letter(s) do not differ at 5% level of significance.

Table 2. Effect of yellow mosaic virus (YMV) disease on yield parameters of urdbean

Cultivars	Number of pods/plant			Mean pod size (cm)			Number of seeds/pod			Mean 100-seed weight			Mean yield/plant (g)		
	Healthy plant	Diseased plant	Per cent decrease	Healthy plant	Diseased plant	Per cent decrease	Healthy plant	Diseased plant	Per cent decrease	Healthy plant	Diseased plant	Per cent decrease	Healthy plant	Diseased plant	Per cent decrease
AARI M 13	27.40 d*	10.44 fgh*	61.90	4.19 e*	3.04 hij*	27.45	5.87 b*	3.95 def*	32.71	4.53 bc*	2.68 ef*	40.84	4.21 g*	1.91 kl*	54.63
AARI M 63	29.71 cd	14.75 f	50.35	4.44 d	3.27 g	26.35	6.23 b	3.80 efg	39.00	4.08 d	2.28 ghi	44.12	4.5 fg	2.26 jk	49.78
AARI M 66	34.94 abc	6.88 gh	80.31	5.27 a	3.61 f	31.50	6.17 b	4.26 d	30.96	4.32 cd	2.21 hi	48.84	4.95 ef	1.81 kl	63.43
AARI M 68	34.75 abc	6.08 h	82.50	4.46 d	3.08 ghi	30.94	6.23 b	9.25 d	31.78	4.19 cd	2.91 e	30.55	6.15 bc	1.38 l	77.56
AARI M 114	34.19 abc	7.56 gh	77.89	4.74 bc	3.54 f	25.32	6.10 b	4.21 d	30.98	4.30 cd	2.71 e	36.98	5.31 de	2.48 ij	53.30
AARI M 121	35.75 ab	15.10 f	56.76	4.51 d	2.85 j	36.81	5.53 c	3.95 hi	37.61	4.82 ab	2.12 hi	56.02	6.90 a	2.80 hi	59.42
AARI M 154	31.50 bcd	7.38 gh	76.57	4.76 b	3.06 ghij	35.71	6.65 a	3.48 ghi	47.67	4.97 a	2.35 fgh	52.72	5.75 cd	1.84 kl	68.00
AARI M 191	20.75 e	11.63 fgh	43.95	4.54 cd	2.86 ij	37.00	6.14 b	3.68 fgh	40.07	4.31 cd	2.61 efg	39.44	4.44 fg	1.87 kl	57.88
AARI M 6B	21.75 e	12.38 fg	43.08	4.16 e	3.09 gh	25.72	5.28 c	4.08 de	22.73	4.53 bc	1.93 i	57.40	4.37 g	3.09 h	29.29
Mash 88	39.00 a	7.69 gh	80.28	4.50 d	2.9 hij	35.56	6.08	3.33 i	45.23	4.04 d	2.21 hi	45.30	6.41 ab	2.08 jk	67.55

* = Any two means having same letter(s) do not differ at 5% level of significance.

stem weight, number of pods/plant, pod size, number of seeds/pod, 100-seed weight and seed yield/plant. The height (from base to the tip) and pod length were recorded in centimeter, while hundred seed weight, seed yield per plant was recorded after syndrying of the plants for fifteen days. The data for each growth parameter were analysed statistically by subjecting it to factorial analysis and difference between cultivars were visualised using Duncan's multiple range test.

RESULTS AND DISCUSSION

Studies of YMV infection on vegetative growth components revealed that there was significant reduction in plant height from 21.62 to 39.81% (table 1). The affected cultivars exhibited 25.81 to 55.63% reduction in number of branches. Cultivars AARI M 13 and AARI M 63 were not affected significantly as regards to number of leaves per plant. However, the affected cultivars exhibited 21.85 to 59.70% decrease in number of leaves. All the cultivars were affected significantly for the dry stem weight which exhibited a reduction ranging from 45.52 to 84.12%. Singh (1981) has reported that growth components of urdbean cultivars decreased on infection with YMV. Chand and Verma (1983) reported the reaction of urdbean varieties to YMV under natural condition at Hissar and found that height was reduced up to 38.2% and fresh shoot weight by 28.5%.

All the cultivars were invariably affected by virus infection and there was 43.08 to 82.50% decrease in number of pods per plant (Table 2). The reduction in pod size ranged from 25.32 to 37.00%. Similarly number of seeds per pod of affected cultivars were reduced from 22.73 to 47.67%. All the cultivars significantly suffered from 30.55 to 57.40% decrease in 100-seed weight and 29.29 to 77.56% decrease in yield/plant. Reduction in yield has also been reported by Singh (1981) while Chand and Verma (1983), on the basis of field experiments, reported that losses in yield per plant were 66.6% and the 100-seed weight was reduced by 25.7%. Shape and appearance of pods and seeds of diseased plants were also considerably distorted and their size reduced. Vohra and Beniwal (1979) found that virus effect on pods per plant, seeds per pod and 1000-seed weight added to reduction in yield. Infection also adversely affected the colour, texture and size of the seeds.

The variable response of different cultivars may probably be explained on the basis of their genetic make up, however, time of infection may also be responsible for this variable response of the cultivars. Vohra and Beniwal (1979) reported that grain yield was decreased on infections up to 50 days after planting but insignificant losses were caused in infections after 60 days. Similarly, Nair and Nene (1974) have found that inoculation of plants up to 3 weeks age resulted in complete loss of grain yield.

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