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Incidence of Dolichos yellow mosaic virus (DYMV) and yield potential in Indian bean (*Lablal purpureus*) F_1'S

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Thirty F_1's of Dolichos bean were screened against Dolichos yellow mosaic virus (DYMV) causing severe yield losses in Indian bean (*Lablab purpureus*). Initial screening was done under field conditions where coefficient of infection (CI) was calculated for each F_1. Among 30 F_1's, only five F_1's namely HADB-3 X VRSEM-887, HADB-3 X VRSEM-894, HADB-4 X VRSEM-894, Swarn Utkrisht X VRSEM-887, Swarn Utkrisht X VRSEM-894 were found symptomless against DYMV with pod yeild of 2.24, 3.38, 3.34, 4.24 and 3.2 kg/plant; 288, 342, 480, 464 and 462 number of pods/plant; 10.4, 10.86, 9.12, 12.86 and 9.24 cm pod length; 2.54, 2.76, 2.86, 2.76 and 2.62 cm pod width; 0.56, 0.82, 0.58, 0.58 and 0.68 cm pod thickness and 4, 4, 5, 5 and 4 number of seeds/pod, respectively. These symptom-less F_1's may be utilized for getting good segregates to DYMV resistance in Indian bean breeding.

Key words: *Lablab purpureus*; Dolichos yellow mosaic virus; Indian bean; Yield; F_1' S

Introduction

Dolichos yellow mosaic virus (DYMV) affects the production of Indian bean in Uttar Pradesh of India (Swanson *et al.,* 1992; Maruthi *et al.,* 2006; Singh *et al.,* 2009). The disease plants produces viruses of the genus bigmovirus family Geminiviridae, consist of circular single standard DNA (ssDNA) genomic components, therefore, the genomes of these viruses consist of circular ssDNA some having one, other having two components (known as DNA-A or DNA-B) (Raj *et al*. 1988; Novot *et al*. 1991; Honley-bowdoin *et al*. 1999). The virus was named Dolichos yellow mosaic virus (DYMV) and was shown to be transmitted by whitefly Bemisia tabaci, family Aleyrodidae, order Hemyptera (Capoor and Varma, 1950; Ramakrishnan *et al*. 1972) causing faint chlorotic specks on leaf lamina, which later develop into bright yellow

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mosaic patches with small islands of green tissue, plant infected early were stunted and produced few flowers (Muniyappa and Veeresh, 1984; Harrison *et al*. 1991; Maruthi *et al*., 2006). Though chemical control measures are being followed to handling this problem in our country but it is uneconomical and environmentally hazardous. Therefore, developments of resistant hybrids/varieties are the safest, economical and a health hazardous free option to meet this threat in DYMV prunes area of the country. Today, hybrids/varieties are gaining popularity due to their high productivity, better quality and adaptation to environmental condition and leaf infestation to biotic and abiotic stresses in vegetable crops including Indian bean. In Indian bean VRSEM-894, VRSEM-887 and VRSEM-860 have been found symptomless against DYMV in Varanasi condition of Uttar Pradesh (Singh *et al.*, 2009) may be used for developing high yield for good pod quality and resistant/tolerant hybrids/varieties crossed with high yield and good pod quality varieties. Hence, a study was carried out to develop least infestation of DYMV with high yielding F_1s in Indian bean.

Materials and methods

Three earlier identified DYMV symptom less accessions VRSEM-894, VRSEM-887 and VRSEM-860 used as tester were crossed with ten high yielding with good quality and highly susceptible to DYMV line in line x tester analysis comprising 30 cross combinations in the year 2007-08 in the month July-December. The matured crossed pods were harvested and F_1s seeds were obtained. These F_1s seeds of 30 cross combinations were sown in the year 2008-09 on 15th July at Indian Institute of Vegetable Research, Varanasi at a spacing of 2 m x 1m row to row and plant to plant, respectively in randomized block design consisting three replications comprising 25 plants of each replication. All the recommended agronomical practices were adapted to raise a good crop. None of the insecticides/fungicides was applied during the course of this investigation. The data on incidence of DYMV was recorded on individual plant basis starting from first week of August (30 days after seed sowing) to April end at 15 days intervals under natural screening. The mean data were further calculated for disease index by using following formula:

$$DI = \frac{\text{Number of diseased plants}}{\text{Total number of plants observed}} \text{ X } 100$$

The data were also subjected for calculation of coefficient infection (CI) by multiplying the disease incidence (DI) and response value (RV). Finally, the

disease reaction was obtained by putting these values to the disease scale (0-5) given by Chakraborty *et al*. (2003) in cowpea and Singh *et al.* (2009) in Indian bean.

Results and discussions

The DYMV incidence and yield potential of line and tester are presented in able 1 revealed that all of the female parents used were highly susceptible which CI values range between 70.56 to 83.33%, whereas the male parents were symptomless. The number of pods/plant, pod length, pod width, pod thickness, number of seeds/pod and pod yield/plant of the parents ranged between 106 - 330, 5.6 - 13.14 cm, 1.4 - 3.04 cm, 0.48 - 0.88 cm, 4 - 6 and 1.44 - 2.42 kg, respectively. The number pods per plant of male parents are generally less than the female parents.

Table 1. DYMV reaction and yield potential of parents

Reaction	Parents	Coefficient infection	Pod characteristics					
			Pods /plant (No.)	Pod length (cm)	Pod width (cm)	Pod thickness (cm)	Seeds /pod (No.)	Pods yield /plant (kg)
Symptoms less	VRSEM-887	0	162	12.18	2.28	0.56	5	1.66
	VRSEM-894	0	156	6.94	2.4	0.48	4	1.31
	VRSEM-860	0	186	5.62	1.86	0.74	4	1.44
Highly susceptible	HADB-4	83.33	264	10.14	3.04	0.58	6	2.02
	VRSEM-186	76.66	338	13.22	2.38	0.52	6	2.39
	SwarnUtkrisht	80.83	266	11.92	2.56	0.72	5	2.18
	VRSEM-933	78.33	300	8.64	1.45	0.71	5	1.84
	KDB-415	70.56	270	12.15	1.67	0.86	6	2.10
	VRSEM-930	71.33	240	9.33	2.63	0.74	6	2.14
	HADB-3	73.33	204	12.02	2.72	0.86	5	1.98
	VRSEM-11	73.33	290	13.14	2.52	0.52	5	2.32
	VRSEM-923	83.33	275	7.84	1.76	0.78	4	1.82
	VRSEM-8	83.33	295	12.64	2.54	0.86	5	2.58

On the basis of CI values among 30 F_1s, only five F_1s namely HADB-3 X VRSEM-887, HADB-3 X VRSEM-894, HADB-4 X VRSEM-894, Swarn Utkrisht X VRSEM-887, Swarn Utkrisht X VRSEM-894 were found symptomless against DYMV (Table 2). Similar results were also reported by Badri *et al.* (2006) in Mung bean and Yaqoob (2007) in Moth bean. These symptomless cross combinations have good yield attributing traits ie. pod yeild of 2.24, 3.38, 3.34, 4.24 and 3.2 kg/plant; 288, 342, 480, 464 and 462 number of pods/plant; 10.4, 10.86, 9.12, 12.86 and 9.24 cm pod length; 2.54, 2.76, 2.86, 2.76 and 2.62 cm pod width; 0.56, 0.82, 0.58, 0.58 and 0.68 cm pod thickness and 4, 4, 5, 5 and 4 number of seeds/pod, respectively (Table 2). Similar results were also reported by Ram and Rajput (1998) in Freanch bean; Virja *et al*.

(2006) in Indian bean and Barad *et al*. (2008) in Mung bean and Bhore *et al*. (1997) in cowpea. However, another five F_1s viz. VRSEM-8 X VRSEM-887, VRSEM-8 X VRSEM-860, HADB-4 X VRSEM-887, VRSEM-11X VRSEM-894 and VRSEM-930 X VRSEM-894 were observed highly resistant. The results are closed conformity with the finding of Badri *et al.* (2006) in Mung bean and Yaqoob (2007) in Moth bean. These resistant cross combinations have good yield attributing traits ie. pod yeild of 5.62, 7.24, 2.44, 3.12 and 2.24 kg/plant; 520, 814, 292, 412 and 310 number of pods/plant; 14.58, 10.46, 13.1, 9.26 and 8.46 cm pod length; 2.76, 2.80, 2.78, 2.62 and 2.62 cm pod width; 0.62, 0.64, 0.58, 0.58 and 0.53 cm pod thickness and 6, 5, 5, 5 and 4 number of seeds/pod, respectively. The results are closed conformity with the finding of Ram and Rajput (1998) in Freanch bean; Virja *et al*. (2006) in Indian bean; Barad *et al*. (2008) in Mung bean and Bhore *et al*. (1997) in cowpea. Similarly, 5 F_1s viz. KDB-415 X VRSEM-894, VRSEM-930 X VRSEM-887, VRSEM-933 X VRSEM-894, HADB-4 X VRSEM-860 and VRSEM-11X VRSEM-887 were found resistant while 7 F_1s (VRSEM-186 X VRSEM-894, VRSEM-11 X VRSEM-860, HADB-3 X VRSEM-860, VRSEM-930 X VRSEM-860, VRSEM-933 X VRSEM-887, Swarn Utkrisht X VRSEM-860 and KDB-415 X VRSEM-887) were moderately resistant with good yield and yield contributing traits. On contrary, only two F_1s viz. VRSEM-923 X VRSEM-860 and VRSEM-933 X VRSEM-860 were observed susceptible; similar results were also reported by Badri *et al.* (2006) in Mung bean with superior horticultural traits which was closely followed by 6 moderately susceptible F_1s viz. VRSEM-8 X VRSEM-894, VRSEM-186 X VRSEM-887, VRSEM-186 X VRSEM-860, KDB-415 X VRSEM-860, VRSEM-923 X VRSEM-894, VRSEM-923 X VRSEM-887 with good yeild contributing traits. Similar results were also reported by Ram and Rajput (1998) in Freanch bean; Virja *et al*. (2006) in Indian bean.

Table 2. DYMV reaction and yield potential of F_1's under natural condition at Indian Institute of Vegetable Research, Varanasi

Reaction	Hybrids	Coefficient infection	Pod characters					
			Pods/ pant (No.)	Pod length (cm)	Pod width (cm)	Pod thickness (cm)	Seeds/ pod (No.)	Pod yield/ plant (kg)
Symptoms less	HADB-3 X VRSEM-887	0	288	10.24	2.54	0.56	4	2.24
	HADB-3 X VRSEM-894	0	342	10.86	2.76	0.82	4	3.38
	HADB-4 X VRSEM-894	0	480	9.12	2.86	0.58	5	3.34
	Swarn Utkrisht X VRSEM-887	0	464	12.86	2.76	0.58	5	4.24
	Swarn Utkrisht X	0	462	9.24	2.62	0.68	4	3.24

	VRSEM-894								
Highly	VRSEM-8	X	3.33	520	14.58	2.76	0.62	6	5.62
resistant	VRSEM-887								
	VRSEM-8	X	5.0	814	10.46	2.8	0.64	5	7.24
	VRSEM-860								
	HADB-4 X		3.33	292	13.1	2.78	0.58	5	2.44
	VRSEM-887								
	VRSEM-11X		5.0	412	9.26	2.62	0.58	5	3.12
	VRSEM-894								
	VRSEM-930	X	5.0	310	8.46	2.62	0.53	4	2.24
	VRSEM-894								
Resistant	KDB-415	X	6.66	380	9.44	2.64	0.46	5	2.48
	VRSEM-894								
	VRSEM-930	X	6.66	390	11.18	2.8	0.54	5	2.84
	VRSEM-887								
	VRSEM-933	X	6.66	440	8.44	2.38	0.54	4	2.44
	VRSEM-894								
	HADB-4 X		6.66	512	7.96	2.76	0.64	4	3.12
	VRSEM-860								
	VRSEM-11X		6.66	486	14.68	2.76	0.76	4	4.12
	VRSEM-887								
Moderately	VRSEM-186		12.5	344	9.34	2.52	0.64	5	2.44
resistant	XVRSEM-894								
	VRSEM-11	X	16.66	446	9.14	2.52	0.62	4	3.02
	VRSEM-860								
	HADB-3 X		16.66	276	9.06	2.46	0.62	5	2.56
	VRSEM-860								
	VRSEM-930	X	16.66	280	8.18	2.8	0.66	5	2.54
	VRSEM-860								
	VRSEM-933	X	16.66	336	12.74	2.42	0.54	5	3.34
	VRSEM-887								
	Swarn Utkrisht	X	12.5	522	8.68	2.78	0.79	5	3.24
	VRSEM-860								
	KDB-415	X	16.66	268	15.12	2.98	0.64	5	2.84
	VRSEM-887								
Moderately	VRSEM-8	X	20.83	374	10.06	2.68	0.52	5	3.05
susceptible	VRSEM-894								
	VRSEM-186	X	20.83	384	14.86	2.66	0.64	5	3.12
	VRSEM-887								
	VRSEM-186	X	20.83	420	9.76	2.5	0.61	5	2.42
	VRSEM-860								
	KDB-415	X	20.83	512	8.64	2.56	0.72	4	3.24
	VRSEM-860								
	VRSEM-923	X	20.83	320	9.96	2.52	0.52	6	2.14
	VRSEM-894								
	VRSEM-923	X	20.83	352	10.08	2.24	0.48	4	2.34
	VRSEM-887								
Susceptible	VRSEM-923	X	50	510	7.32	2.1	0.66	4	2.92
	VRSEM-860								
	VRSEM-933	X	50	514	8.02	2.16	0.6	5	3.44
	VRSEM-860								
Highly susceptible	-------		--------	-------		-------	-------	-------	--------

Hence, present investigation revealed that the cross combinations HADB-3 X VRSEM-887, HADB-3 X VRSEM-894, HADB-4 X VRSEM-894, Swarn Utkrisht X VRSEM-887 and Swarn Utkrisht X VRSEM-894 were

symptom-less, may be utilized for getting good segregates to DYMV resistance in Indian bean breeding.

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