

Processors & Growers Research Organisation

Pea Seed-Borne Mosaic Virus - Seed Transmission Studies1991

SUMMARY: Tests on seedlings grown from 27 seed samples of six vining pea varieties with a range of seed infection from 1-58%, indicated that at least 10% of infected seed gave rise to infected seedlings when grown in the glasshouse. In comparison, one of two new combining pea varieties tested, showed a much higher level of seed to seedling infection.

OBJECT:

1. To examine the seed to seedling transmission rate for pea seed-borne mosaic virus in a range of commercially available vining pea cultivars.
2. To clarify existing guidelines for an acceptable level of seed infection for the production of commercial vining pea crops.

METHODS:

1. Seed tests For each seed stock 100 seeds were soaked in water and then crushed individually in PSB tween extraction buffer with Triton X 100. The presence of virus was tested using an indirect F (ab)₂ ELISA method as improved by Rothamsted Experimental Station.

2. Seedling tests Twenty seven seedlots of 6 vining peas varieties were selected as having a seed infection level ranging from 1-58%. Two hundred seeds were planted in soil-less compost and grown in the glasshouse at 22°C ± 5°C for 4 weeks. The number of seedlings displaying typical symptoms of PSbMV were recorded and then the top third of the shoots of all plants were sampled and tested individually for PSbMV using the ELISA procedure.

RESULTS: Comparisons of seed to seedling infection in a number of vining pea cultivars with low to high levels of seed infection were investigated (Table 1). In general, seedling infections were not detected, or only occasionally, in samples with low levels (less than 5%) of seed infection. In these cases the rate of seed to seedling transmission was probably at too low a level to be detected in a limited sample size of only 200 plants. However, the number of infected seedlings resulting from medium to high levels of seed infection appeared to vary considerably, both across cultivars and within specific cultivar groups, although the number of infected seedlings produced was greater in cvs. Visto, Waverex and Small Sieve Freezer. A number of symptomless plants were also found to contain virus, especially in the cv. Visto. Virus was not detected in a few plants which appeared to show symptoms but these may have been abnormally developed seedlings.

Two new combining pea lines (A & B) showing high seed infections were also studied. Line B showed strong symptom expression in the glasshouse, with tightly rolled leaves and a stunting and malformation in growth. Some seedlots showed high rates of seed to seedling infection (Table 2). In Line A the rate of seed transmission was found to be less, and more comparable to results found with the vining pea types.

Table 1. Seed transmission rates of PSbMV in six vining pea cultivars

Cultivar	% seed infection	No. plants tested	No. with symptoms	No. infected seedlings	% infected seedlings	Transmission rate (%)
Hurst Green Shaft	6	174	2	1	0.6	10.0
	8	188	1	4	2.1	26.0
	29	205	2	2	0.98	3.4
Scout	3	200	1	1	0.5	16.6
	3	211	0	0	0	0
	3	214	0	0	0	0
	4	200	0	0	0	0
	7	208	0	0	0	0
	26	200	2	1	0.5	2.0
	33	100	1	1	1.0	3.0
Tristar	1	211	0	0	0	0
	1	208	0	0	0	0
	5	210	0	0	0	0
Visto	3	197	0	0	0	0
	17	200	1	4	2.0	11.8
	18	200	0	10	5.0	28.0
	19	215	0	0	0	0
	24	214	3	4	2.0	8.3
	58	186	3	14	7.5	13.0
Small Sieve Freezer	5	181	0	0	0	0
	33	197	4	8	4.1	12.0
Wäverex	1	200	0	0	0	0
	29	100	3	3	3.0	10.3
	34	100	2	2	2.0	5.9
	39	100	4	4	4.0	10.3
	47	190	2	1	0.5	1.1
	51	208	5	16	7.7	15.1

Table 2. Seed transmission rates of PSbMV in two lines of combining pea

Breeding line	% seed infection	No. plants tested	No. with symptoms	No. infected seedlings	% infected seedlings	Transmission rate (%)
Line A	5	218	0	1	0.5	10.0
	7	222	0	0	0	0
	7	219	0	0	0	0
	12	211	3	3	1.4	8.6
	36	202	1	8	4.0	11.1
	68	71	1	1	1.4	2.0
Line B	16	216	7	6	2.8	17.5
	22	193	29	34	17.6	80.0
	25	213	4	5	2.4	9.6
	34	209	25	33	15.8	46.5

CONCLUSIONS: Good correlation between seed transmission and ELISA positive embryos was found, whilst whole seed assays gave a large overestimation of the percentage of transmission. This may explain the variation found in seedling results, although some high seed transmission rates were observed. Since growing-on tests are more time consuming, and less viable on a large scale, further work may be necessary to evaluate methods which may include testa removal to provide a more accurate relationship between seed and seedling infection. However, the whole-seed test has the advantage in being able to detect relatively low levels of infection within a seedlot.

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