

Evaluation of advance lines for resistance to *Fusarium* wilt and horticultural traits in garden pea (*Pisum sativum*)*

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Garden pea (*Pisum sativum* var. *hortense*) is grown for green pods throughout the country including hilly regions as it fits well in the cropping system and provide remunerative price to the growers. The crop is normally sown in the field during mid October to November in northern plains of the country, however, earliest sown crop fetch more profit but at the risk of *Fusarium* wilt (*Fusarium oxysporum* f. sp. *pisi*). Too early sown crop is much more vulnerable to wilt due to high soil temperature and moisture. This soil-borne fungal disease is important worldwide and causes serious losses, particularly to green pea crop. None of the commercial cultivars have resistance to this pathogen (Grunwald *et al.* 2003).

Thus, based on the past information generated on screening in wilt sick plots at Indian Agricultural Research Institute (IARI), New Delhi, certain promising germplasm and advance breeding lines showing resistance to *Fusarium* wilt formed the basis of the present studies to screen/evaluate for identifying genotypes showing high degree of resistance with acceptable horticultural traits.

Eight stable advance breeding lines consisting of four early duration ('GP 17', 'GP 207', 'GP 447' and 'Pusa Pragati') and four medium duration ('GP 378', 'GP 468', 'GP 471' and 'GP 473') lines were sown in sick plot to evaluate/screen for disease reaction in comparison to highly susceptible variety 'Arkel' in randomized complete block design with three replications at Division of Vegetable Science, IARI, New Delhi during 2006–08. Seeds of each entry were sown in first week of October at a spacing of 40 cm × 5 cm apart in 5m² plot keeping three rows of 4.2m length each. The crop was fertilized with farmyard manure 10 tonnes/ha and NPK (20:60:40 kg/ha), followed by common cultural practices. The observations on the wilting of plants were recorded at 10 days interval starting after 10 days

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of seed sowing till fruiting period. Per cent incidence of plants wilted was recorded and categorized as immune (0%), highly resistant (1–10%), resistant (11–30%), moderately resistant (31–50%), susceptible (50–80%) and highly susceptible (81–100%) as suggested by Ramphal *et al.* (1986). The green pod yield and yield attributes were recorded from natural field conditions and standard statistical procedures were followed to analyze the data (Gomez and Gomez 1983).

Screening data on disease incidence obtained from wilt sick plot showed variable degree of resistance for wilt disease ranging from 10 to 50% and susceptibility up to 95% (Table 1). It is clearly evident from data that genotype 'GP 17' was found to be highly resistant showing mortality up to 10% (Table 1). Similarly genotype 'GP 207' and 'GP 473' were rated as resistant (11–30%); 'GP 447', 'GP 471' and 'GP 468' as moderately resistant (31–50%), while 'GP 378' and 'Pusa Pragati' as susceptible (50–80%). However, a widely grown pea cultivar 'Arkel' was found to be highly susceptible (85–95%). The early maturing genotypes 'GP17' and 'GP 207' and a medium maturing genotype 'GP 473' have shown

Table 1 Disease reaction of garden pea advance lines against *Fusarium* wilt

Lines/ genotypes	Wilt incidence (%)			Disease reaction
	2007	2008	mean	
'GP 17'	9	10	9.5	HR
'GP 207'	20	18	19.0	R
'GP 378'	62	60	61.0	S
'GP 447'	40	35	37.5	MR
'GP 468'	45	40	42.5	MR
'GP 471'	40	37	38.5	MR
'Arkel' (Check)	85	95	90.0	HS
'Pusa Pragati'	65	70	67.5	S
'GP 473'	27	25	26.0	R

HR, highly resistant; R, resistant; MR, moderately resistant; S, susceptible; HS, highly susceptible

Table 2 Performance of advance breeding lines/genotypes along with yield and other horticultural traits

Lines/ genotypes	Green pod yield (tonnes/ha)				First green pod harvest (days)	Pod length (cm)	Seeds/pod	Shelling (%)
	2006	2007	2008	Pooled mean				
'GP 17'	9.00	8.53	9.63	9.05	62	7.8	7	56.0
'GP 207'	7.40	6.93	8.60	7.64	62	7.8	7	56.0
'GP 378'	5.00	5.20	5.70	5.30	93	7.6	7	40.0
'GP 447'	8.20	8.00	7.07	7.76	66	8.1	7	46.0
'GP 468'	7.60	6.60	6.88	7.03	73	8.0	7	52.0
'GP 471'	8.20	7.93	7.97	8.03	73	8.2	8	48.0
'Arkel' (Check)	5.80	6.13	7.20	6.38	62	8.0	7	44.0
'Pusa Pragati'	4.80	4.93	5.63	5.12	62	9.7	8	56.0
'GP 473'			10.00	10.00	83	10.1	9	60.0
CD ($P=0.05$)	1.11	9.1	1.45		4	0.2	1	1.8
CV (%)	9.80	8.20	11.00		3	1.5	8	2.0

consistency in resistance (11–30%) against wilt over the years. Sharma *et al.* (2010) have also reported 'Arkel' garden pea (early maturity) and 'Azad Pea 1' (medium maturity) is susceptible to *Fusarium* wilt and screened induced mutants of both susceptible cultivars to select/ identify resistant mutants against wilt.

Data pertaining to genotype/ breeding lines yield potential and yield attributes assessed under normal field condition is presented in Table 2. All the genotypes differed significantly in terms of yield potential. Among the resistance genotypes, GP 473 recorded maximum green pod yield (10 tonnes/ha) showing medium duration in maturity (83 days), highest pod length (10.1cm) containing nine seeds/pod and shelling (60%). The highly resistant genotype 'GP 17' recorded second highest yield (9.05 tonnes/ha) and also showed early duration in maturity (62 days) having medium pod length (7.8cm) with seven seeds/pod and better shelling (56%) as compared to check variety 'Arkel' (6.38 tonnes/ha, 62 days, 8cm, 7 seeds and 44% respectively). 'GP 207' also remained at par statistically in yield with 'GP 17' but similar in yield attributing traits. Besides the other genotypes showing moderate resistance ('GP 447', 'GP 468', 'GP 471'), 'GP 471' a medium duration genotype also yielded 8.03 tonnes/ha which was at par with 'GP 17' and possessed better pod length (8.2 cm) containing 8 seeds/ pod but remained low in shelling (48%).

Thus it is concluded that genotype 'GP 17' and 'GP 207' in early duration, while 'GP 473' in medium duration were found as promising lines having high degree of resistance to *Fusarium* wilt coupled with better horticultural traits. These lines can be developed as varieties for realizing higher

yield in early cropping and also can be used as source for further improvement programme.

SUMMARY

Field experiments were conducted during 2006–08 against *Fusarium* wilt in wilt sick plot to screen/evaluate eight advance promising lines comprising four early duration ('GP 17', 'GP 207', 'GP 447', 'Pusa Pragati') and four medium duration ('GP 378', 'GP 468', 'GP 471' and 'GP 473') lines/genotypes along with highly susceptible variety 'Arkel' for identification of resistant lines coupled with acceptable horticultural traits. Observations on wilting ranged from 9 to 95% mortality. The lines 'GP 17', 'GP 207' and 'GP 473' showed high degree of resistance (9–26%) against *Fusarium* wilt, besides holding good promise for better yield with acceptable horticultural traits.

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