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Differential reaction and source of resistance to wilt caused by *Pseudomonas solanacearum* in brinjal (*Solanum melongena*)

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ABSTRACT

An experiment was conducted during winter season of 1990–91 to 1992–93 to study reaction and source of resistance to wilt caused by *Pseudomonas solanacearum* Smith in brinjal (*Solanum melongena* L.) in bacterial sick plot. Only 5 local accessions ('CH 243', 'CH 245', 'CH 247', 'CH 249' and 'CH 309') of brinjal showed resistant reaction (0–20% wilt) in the mean data of 3 years to this disease. Among these 'CH 245', 'CH 249' and 'CH 309' were found stable for resistance as well as for high yield potential. Out of 15 genotypes proved moderately resistant, 6 local collections ('CH 157', 'CH 242', 'CH 246', 'CH 277', 'CH 278' and 'CH 306') gave high yield. Of the 6 high-yielding collections, 'CH 157' and 'CH 278' were found stable in yield as well as reaction to wilt. The resistant as well as moderately resistant, stable genotypes may be used as donor parent in breeding programme. Among the highly susceptible genotypes, 'CH 152' was found high yielder.

Bacterial wilt caused by *Pseudomonas solanacearum* Smith is one of the most important dreaded diseases (Kelman 1953), causing considerable yield loss. Sufficient work has been done on host resistance (Sitaramaiah *et al.* 1981, 1984, Narayan and Nair 1983, Das and Panda 1985, Singh 1991), but no information is available on source of resistance in brinjal (*Solanum melongena* L.) for this disease from the eastern plateau. Hence the present investigation was undertaken.

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MATERIALS AND METHODS

Two sets of germplasm were collected based on agro-climatic zones. First set comprised 37 accessions ('CH 95', 'CH 108', 'CH 152', 'CH 154', 'CH 155', 'CH 156', 'CH 157', 'CH 158', 'CH 159', 'CH 163', 'CH 168', 'CH 203', 'CH 225', 'CH 228', 'CH 229', 'CH 242', 'CH 243', 'CH 245', 'CH 246', 'CH 247', 'CH 249', 'CH 251', 'CH 264', 'CH 265', 'CH 269', 'CH 274', 'CH 277', 'CH 278', 'CH 301', 'CH 306', 'CH 309', 'CH 325', 'CH 331', 'CH 82', 'BB 7', 'BB 11' and 'BB 44') from eastern plateau and hill region, ie Zone 7, as local. The second set comprised 21 entries ('CH 4', 'CH 240',

'CH 171', 'CH 198', 'Ram Nagar Giant', 'Pant 7', 'Pant Rituraj', 'CH 233', 'Pusa Purple Round', 'BR 11', 'UB 4', 'CH 20', 'Bhagyamati', 'Manjrigota', 'IHR 236' ('SM 6-7'), 'IHR 176 M 8', 'IHR 178', 'Maroomarvel', 'CH 234', 'CH 237' and 'CH 28') from other agro-climatic zones of India. All entries were tested for resistance to bacterial wilt caused by *P. solanacearum* in sick plot (bacterial population 840 000 colony-forming units/g soil). The cultivar 'Arka Shirish' was used as the susceptible control.

The experiment was conducted during winter season of 1990–91 to 1992–93 at Ranchi. Seedlings of 25 days were planted in 2.5 m^2 plot, consisting of 10 plants at 50 cm x 50 cm spacing with 2 replications in randomized block design. The seedlings were inoculated by dipping in bacterial suspension (optical density 0.1) for 10 min before planting.

The recommended fertilizer doses were applied. The wilt (%) was recorded at 30, 60, 90 and 120 days after planting. The data were statistically analysed after angular transformation of wilt (%). The entries were grouped according to reaction to the pathogen on the basis of wilt (%) following the method of AVRDC, Shanhua, Indonesia (1991): resistant (R), 0–20% wilt; moderately resistant (MR), 21–41% wilt; moderately susceptible (MS), 41–70% wilt; and susceptible (S), 71–100% wilt.

The yield per plot was also recorded during 1990–91 and 1991–92 and statistically analysed. The homogeneity error variance of 2 years data was tested following Bartlett's χ^2 test (Panse and Sukhatme 1978). The yield was classified in 3 categories: low, below 10 tonnes/ha; average, 10–25 tonnes/ha; high, more than 25 tonnes/ha.

RESULTS AND DISCUSSION

Among the genotypes significant variation in reaction was observed during each year and also in pooled data of 3 years. The disease incidence on the control 'Arka Shirish' during 1990–91 was 94.0% than during 1991–92 (82.5%) and 1992–93 (60%).

Disease resistance

Resistant: Out of 33 local collections, only 5 ('CH 243', 'CH 245', 'CH 247', 'CH 249' and 'CH 309') showed 0–20% wilting. These genotypes showed resistant reaction during 1991–92 and 1992–93, though initially 3 ('CH 243', 'CH 249' and 'CH 309') showed moderate resistance only during 1990–91. 'CH 249' and 'CH 309' showed stable resistant reaction in 3 years. 'CH 245' and 'CH 247' showed resistant reaction continuously for 2 years in spite of showing moderately susceptible reaction in the beginning. The coefficient variation was 27.5%, indicating less variation among the genotypes. The differences between them were significant for wilting (%).

Moderately resistant: Fifteen genotypes were found moderately resistant (Table 1). Of the 14 genotypes, 8 local ones ('CH 157', 'CH 225', 'CH 242', 'CH 246', 'CH 251', 'CH 277', 'CH 278' and 'CH 306') showed resistant to moderately resistant reaction to bacterial wilt during 1991–92 and 1992–93. However, these were found moderately susceptible to susceptible in the beginning except 'CH 246' and 'CH 278' (moderately resistant), and 'BB 44' (from Bhubaneshwar) was found resistant during the first 2 years but moderately susceptible during 1992–93. 'Bhagyamati' (from Hyderabad) was initially moderately susceptible and then it showed resistant to moderately resistant reaction in the other 2 years. The coefficient of variation

Table 1 *Reaction of brinjal to bacterial wilt in sick plot*

Reaction	Genotype
Resistant	'CH 243', 'CH 245', 'CH 247', 'CH 249' and 'CH 309'
Moderately resistant	'CH 157', 'CH 225', 'CH 234', 'CH 242', 'CH 246', 'CH 251', 'CH 277', 'CH 278', 'CH 306', 'CH 20', 'CH 28', 'CH 237', 'CH 240', 'BB 44' and 'Bhagyamati'
Moderately susceptible	'CH 4', 'CH 82', 'CH 95', 'CH 108', 'CH 152', 'CH 154', 'CH 155', 'CH 156', 'CH 158', 'CH 159', 'CH 163', 'CH 168', 'CH 171', 'CH 198', 'CH 203', 'CH 228', 'CH 229', 'CH 233', 'CH 264', 'CH 265', 'CH 274', 'CH 301', 'CH 325', 'CH 331', 'BB 7', 'BB 11', 'BR 11', 'UB 4', 'Manjrigota', 'Maroomarvel', 'IHR 236' ('SM 6-7'), 'Pant Rituraj' and 'Pant 7'
Susceptible	'CH 269', 'IHR 178', 'IHR 176 M 8', 'Ram Nagar Giant', 'Pusa Purple Round' and 'Arka Shirish'

Based on mean data of 3 years on wilt (%)

during 1991–92 was quite high (47.4%). The result clearly indicated genotype x environment interaction which was further evident from the low (18.8%) coefficient of variation during 1992–93.

Moderately susceptible: Thirty-three genotypes were moderately susceptible to bacterial wilt (Table 1). Out of 19 local genotypes, only 6 ['CH 203', 'CH 229', 'CH 274', 'CH 301', 'CH 331' and 'CH 82' (Rourkela collection)] showed resistant to moderately resistant reaction during 1991–92 and 1992–93, but these genotypes were significantly different from 'BB 7', 'BB 11', 'BR 11', 'IHR 236' ('SM 6-7'), 'Maroomarvel', 'Pant Rituraj' and 'Pant 7' which were moderately resistant during 1991–92 only. These genotypes were at par among themselves during 1990–91 but significantly different from susceptible lines during 1992–93.

Susceptible: Six genotypes ['Arka Shirish' (control), 'CH 269' (local), 'IHR 178', 'IHR 176 M 8', 'Pusa Purple Round' and 'Ram Nagar Giant'] were found susceptible to wilt. However, 'Ram Nagar Giant' showed resistance during 1991–92 but showed susceptibility in the other 2 years.

Yield

The coefficient of variation was 90.9% during 1990–91 and 39.9% during 1991–92. However, the significant differences between the genotypes for yield was observed in both the years. The error variances were found heterogeneous ($\chi^2 = 12.42^{**}$). The yield of all the resistant local collections ('CH 243', 'CH 245', 'CH 247', 'CH 249' and 'CH 309') was average to high and stable during both the years. In moderately resistant lines, the local genotypes ('CH 157', 'CH 278', 'CH 242', 'CH 246', 'CH 277', 'CH 306' and 'BB 44') with high-yield potential showed stable yield in both the years. In moderately susceptible and susceptible lines, none showed stable yield except 1 local line 'CH 152', which had stable, high-yield potential during both the years. The yield of the other lines was found average to below-average in both the years.

Swaminathan and Srinivasan (1971) and Vijaygopal and Sethumadhavan (1973) reported monogenic resistance to bacterial wilt, whereas Yamakawa (1976) reported polygenic resistance. This may be due to different genotypes used by the different workers.

Table 2 Yield performance of classified lines of brinjal

Disease reaction	Yield (tonnes/ha)					
	1990–91			1991–92		
	< 10	10–25	> 25	< 10	10–25	> 25
Resistant		'CH 243', 'CH 247'	'CH 245', 'CH 249', 'CH 309'		'CH 247', 'CH 249'	'CH 243', 'CH 245', 'CH 309'
Moderately resistant	'CH 20', 'CH 28', 'CH 225', 'CH 234', 'CH 237', 'CH 240', 'CH 251', 'Bhagyamati'	'CH 157', 'CH 242' 'CH 246', 'CH 277', 'CH 306', 'BB 44'	'CH 278'	'Bhagyamati'	'CH 20', 'CH 28', 'CH 237', 'CH 240', 'CH 242', 'CH 246', 'CH 277', 'CH 278', 'CH 306', 'BB 44'	'CH 157', 'CH 225', 'CH 234', 'CH 251'
Moderately susceptible	'CH 4', 'CH 82', 'CH 95', 'CH 108', 'CH 155', 'CH 171', 'CH 198', 'CH 203', 'CH 233', 'CH 264', 'CH 228', 'CH 229', 'CH 274', 'CH 301', 'CH 325', 'CH 331', 'Manjrigota', 'Pant 7', 'Maroomarvel'	'CH 154', 'CH 156', 'CH 158', 'CH 159', 'CH 163', 'CH 168', 'CH 265', 'BB 7', 'BB 11', 'BR 11', 'UB 4', 'IHR 236', ('SM 6-7'), 'Pant Rituraj'	'CH 152'	'CH 4', 'CH 108', 'CH 155', 'CH 156', 'CH 233', 'CH 325', 'Manjrigota', 'IHR 236' ('SM 6-7') 'Pant 7'	'CH 82', 'CH 95', 'CH 154', 'CH 158', 'CH 159', 'CH 163', 'CH 168', 'CH 171', 'CH 198', 'CH 228', 'CH 229', 'CH 264', 'CH 265', 'CH 274', 'CH 301', 'CH 331', 'BB 11', 'UB 4', 'Macroomarvel', 'Pant Rituraj'	'CH 152', 'CH 203', 'BB 7', 'BR 11'
Susceptible	'CH 269', 'IHR 178', 'IHR 176 M 8', 'Ram Nagar Giant', 'Pusa Purple Round', 'Arka Shirish'			'CH 269', 'IHR 178', 'IHR 176 M 8', 'Ram Nagar Giant', 'Pusa Purple Round', 'Arka Shirish'		

It was concluded that resistance available in 5 genotypes ('CH 243', 'CH 245', 'CH 247', 'CH 249' and 'CH 309') may be utilized to breed a resistant variety of brinjal for eastern plateau and hilly region.

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