

TWO NEW WILT RESISTANT F₁ HYBRIDS IN BRINJAL (*SOLANUM MELONGENA* L.)

T. R. Gopalakrishnan, C. Narayanan Kutty and P. K. Singh

Kerala Agricultural University, Vellanikkara, Trichur, India

Abstract: Ten wilt resistant and divergent genotypes of brinjal (five purple fruited and five light green / white fruited) were crossed separately and the resulting eight F₁ hybrids were evaluated for their performance in a bacterial wilt sick plot at Vellanikkara, Trichur. All the F₁ hybrids showed high yield potential with resistance to wilt. Based on overall superiority in terms of yield, consumer acceptability and resistance to wilt, two purple fruited hybrids viz., Surya x SM-116 (purple, round to oval) and Arka Keshav x SM-71 (purple, long) were selected and evaluated further for two more seasons. Both the hybrids were resistant to wilt and had a yield potential of 91.31 and 89.07 t ha⁻¹ respectively.

Key words: Brinjal, hybrid, productivity, wilt resistance.

INTRODUCTION

Hybrids play a vital role in increasing productivity of vegetables due to their high yield potential, earliness, quality attributes, and resistance to biotic and abiotic stresses. Although hybrid technology is of recent origin in India, large number of hybrids are available today in solanaceous vegetables like brinjal, tomato and capsicum. Medium size of flowers, large number of seeds in a single fruit and high fruit set are some of the factors favouring commercial exploitation of heterosis in brinjal. However all the hybrids released so far are not ideal for cultivation in coastal regions of the country where bacterial wilt caused by *Ralstonia solanacearum* E.F. Smith is a major problem. There is an urgent need to develop hybrids having resistance to major diseases in brinjal. In the present study, an effort was made to develop F₁ hybrids having commercially acceptable qualities and high yield potential with resistance to bacterial wilt.

MATERIALS AND METHODS

Ten wilt resistant and divergent genotypes maintained in the ICAR Adhoc Scheme on Heterosis Breeding in Chilli and Brinjal Associated with Resistance to Bacterial Wilt at the Kerala Agricultural University, Trichur were utilised for the present study. The selected genotypes included five purple fruited and five light green / white fruited ones. To develop F₁ hybrids, the genotypes were raised in the field during 1994-95 and crosses were made between genotypes having similar / compatible fruit colour. Parents for hybridisation were selected based on resistance to bacterial wilt, productivity, market qualities like colour, shape and size of fruits. The five purple fruited lines (Surya, Composite-

2, SM-116, Arka Keshav and SM-71) and five green fruited lines (Swetha, SM-141, Thiruvalla Green Round (TGR), West Coast Green (WCG) and SM-63 were crossed to yield eight F₁ hybrids (four in each fruit colour) and the hybrids were evaluated along with their parents in a randomised block design with two replications during October '95 to January '96 with 25 plants / genotype. The plants were grown in a wilt sick plot along with a wilt susceptible check Pusa Kranti. The recommended package of practices (KAU, 1993) were followed in raising the crop. The wilt incidence was confirmed through ooze test. Observations were made on important quantitative characters like days to flower, fruit length, fruit diameter, fruits / plant, fruit weight and productivity. The promising F₁ hybrids identified were further evaluated along with their parents for two more seasons during February to May '96 and July to October '96 to confirm their yield potential and resistance to bacterial wilt.

RESULTS AND DISCUSSION

In general, the hybrids showed increased vigour and vegetative growth. Among the purple fruited hybrids, maximum heterosis for days to flower was observed in the hybrid Surya x Composite-2 (Heterobeltiosis, HB = -6.07 per cent) (Table 1). The length of fruit was maximum in the purple fruited hybrid Arka Keshav x SM-71 (21 cm). The heterobeltiosis (30.03 per cent) and standard heterosis (138.64 per cent) for fruit length were also maximum in this hybrid. Among the green fruited hybrids, Swetha x SM-63 showed the highest heterosis for this character. For fruit diameter, heterobeltiosis was the highest in Surya x SM-116 (30.68 per cent).

Table 1. Earliness and fruit size of parents and F₁ hybrids during Oct 95 to Feb 96

Parent /hybrid	Days to flower			Fruit length, cm			Fruit diameter, cm		
	Mean	HB%	SH%	Mean	HB%	SH%	Mean	HB%	SH%
I. Purple fruited									
Surya	57.7			8.8			3.7		
Composite-2	67.9			6.7			4.8		
SM-116	65.1			7.6			4.4		
Arka Keshav	58.7			16.2			2.7		
SM-71	70.0			11.4			3.5		
Surya x Composite-2	54.2	-6.07	-6.07	7.7	-13.07	-13.07	5.6	16.67*	51.35**
Surya x SM-116	57.0	-1.21	-1.21	8.6	-2.84	-2.84	5.8	30.68**	55.41**
Arka Keshav x Composite-2	57.4	-2.04	-0.35	15.8	-2.17	78.98**	5.5	13.54	47.3**
Arka Keshav x SM-71	62.8	6.53	8.84	21.0	30.03**	138.6**	4.1	17.14	10.81
II. Light green / white fruited									
Swetha	45.7			12.0			3.0		
SM-141	56.8			14.1			3.7		
SM-63	64.2			15.8			3.6		
WCG (S)	63.4			12.5			3.6		
TGR	62.8			8.5			3.9		
Swetha x SM-141	52.0	13.8	13.8	13.7	-2.49	14.17	3.7	0.00	23.33*
Swetha x SM-63	48.5	6.13	6.13	16.7	5.70	39.17	2.9	6.94	30.0**
SM-141 x WCG(S)	62.2	9.51	36.1**	12.6	-10.68	0.95	4.1	12.33	36.67**
SM-141 x TGR	62.3	9.68	36.3**	13.1	-7.12	9.17	5.1	29.49**	70.4**
Mean-Parents	60.6			11.42			3.67		
Mean-Hybrids	56.4			13.37			4.74		
CD (0.05)	6.33			1.88			0.65		
CD (0.01)	8.65			2.57			0.89		

HB = Heterobeltiosis; SH = Standard heterosis; *Significant at 5% level; **Significant at 1% level

The number of fruits and average fruit weight were more in the hybrids than their parents. The hybrid Arka Keshav x SM-71 recorded the maximum number of 52.4 fruits / plant (Table 2) with significant heterosis. All the purple fruited hybrids showed heterosis for this trait. Among the white / light green fruited hybrids, maximum heterosis was observed in the cross SM-141 x TGR. The hybrid Surya x SM-116 was ranked first for average fruit weight (138.2 g) with significant positive heterosis. Swetha x SM-63 had the highest heterosis values among the green fruited hybrids for this character.

Increased yield in brinjal F₁ hybrids has been reported by various workers (Geetha and Peter, 1993; Varma, 1995). The increased yield has been attributed to increase in number of fruits/plant, fruit length and fruits / branch (Singh, 1980; Singh and Kumar, 1988). In the present study, the maximum heterobeltiosis (252.94%)

and standard heterosis (334.78%) for yield was observed in the purple fruited hybrid, Arka Keshav x SM-71 with a yield potential of 60 t ha⁻¹. This hybrid had the longest fruits and the maximum heterosis for fruit length and fruits / plant. Although the white fruited hybrid SM-141 x TGR was marginally superior to this hybrid in yield, the presence of prickles on stem and leaves makes it unacceptable for commercial cultivation. Another purple large fruited hybrid, Surya x SM-116 which had the largest fruits, also recorded higher yield on par with Arka Keshav x SM-71. This hybrid also had attractive round to oval shaped fruits preferred in the local market. Two hybrids viz., Surya x Composite-2 and Arka Keshav x Composite-2 had bitter fruits and hence they were discarded. All the parents and hybrids were found resistant to bacterial wilt (Table 3). The susceptible check, Pusa Kranti showed 100 per cent wilting confirming the presence of inoculum in the test field. Among the parents,

Table 2. Average fruit weight and productivity of parents and hybrids in brinjal during Oct 95 to Feb 96

Parents/hybrids	Average fruit weight, g			Fruits per plant			Productivity, t ha ⁻¹		
	Mean	HB%	SH%	Mean	HB%	SH%	Mean	HB%	SH%
I. Purple fruited									
Surya	62.0			19.8			13.80		
Composite-2	113.4			27.6			27.80		
SM-116	106.2			12.7			22.30		
Arka Keshav	57.6			10.7			13.40		
SM-71	86.7			16.0			17.00		
Surya x Composite-2	120.5	6.26	94.35**	29.6	7.25	49.49**	39.40	41.73	185.51**
Surya x SM-116	131.0	23.35**	11.29**	42.2	113.1**	113.1**	51.00	128.7**	269.6**
Arka Keshav x Composite-2	138.2	21.87**	122.9**	38.6	39.86**	94.95**	46.50	67.27**	236.96**
Arka Keshav x SM-71	105.2	21.34*	69.68**	52.4	227.5**	164.7**	60.60	252.94*	334.78**
II. Light green / white fruited									
Swetha	67.7			30.2			15.80		
SM-141	126.1			32.9			28.60		
SM-63	69.6			12.1			10.40		
WCG(S)	76.9			21.2			21.20		
TGR	83.4			14.9			15.30		
Swetha x SM-141	95.7	-24.11**	41.36**	29.3	-10.94	-2.98	21.80	-23.78	37.97
Swetha x SM-63	95.5	37.21**	41.06**	39.4	30.46*	30.46*	25.40	60.76*	60.76*
SM-141 x WCG(S)	112.9	-10.47	66.76**	26.2	-20.36	-13.24	23.20	-18.88	46.84
SM-141 x TGR	117.6	-6.75	73.71	49.6	50.76**	64.29**	60.50	111.54**	282.9**
Mean (parents)	84.3			22.9			21.80		
Mean (hybrids)	114.6			38.2			40.70		
CD (0.05)	14.48			7.79			8.72		
CD (0.01)	19.79			10.6			11.93		

HB = Heterobeltiosis; SH = Standard heterosis; *significant at 5% level; **significant at 1% level

Composite-2, SM-63 and TGR had wilt incidence of 18, 12 and 6 per cent respectively. Crosses involving SM-63 also showed wilt incidence (4 %). Geetha and Peter (1993) reported that resistance to bacterial wilt is controlled by a single recessive gene. Crosses involving resistant parents only can produce highly resistant F₁'s. In the present study also the two promising wilt resistant hybrids viz., Surya x SM-116 and Arka Keshav x SM-71 were developed by crossing wilt resistant parents. Considering the over all performance (consumer acceptability and resistance to bacterial wilt), these two hybrids were carried forward for further evaluation and confirmation of their yield potential. In the detailed evaluation, none of the parents or hybrids was affected by wilt. During summer, yield was generally low compared to kharif crop (Table 4) and it was mainly due to the severe infestation of jassids

Amrasca biguttula biguttula. However, both the hybrids recorded considerably higher yields than their parents. The hybrid Surya x SM-116 recorded 39.66 t ha⁻¹ while the other hybrid Arka Keshav x SM-71 recorded 42.55 t ha⁻¹ with 116 per cent more yield than its better parent. In the kharif season (July - Oct' 96), both the parents and hybrids recorded the highest yields. This was mainly due to the better climate during the growth season, long fruiting phase due to the distributed rainfall from January to November and absence of Jassid infestation. The maximum yield was recorded in the hybrid Surya x SM-116 (91.31 t ha⁻¹) followed by Arka Keshav x SM-71 (89.07 t ha⁻¹) compared to the best performing standard parent Surya (38.26 t ha⁻¹). In general, the yield of hybrids was almost thrice than that of their parents. The F₁ hybrid namely Surya x SM-116 has attractive large oval to round violet fruits

Table 3. Bacterial wilt in brinjal lines and their hybrids

Sl. No	Genotypes	Wilt (%)	Disease reaction
1	Surya	0	R
2	Composite-2	18	R
3	SM-116	0	R
4	Arka Keshav	0	R
5	SM-71	0	R
6	Swelha	0	R
7	SM-141	0	R
8	SM-63	12	R
9	WCG (S)	0	R
10	TGR	0	R
11	Surya x Composite-2	6	R
12	Surya x SM-116	0	R
13	Arka Keshav x Composite-2	18	R
14	Arka Keshav x SM-71	0	R
15	Swetha x SM-141	0	R
16	Swetha x SM-63	4	R

Scale: 0-20% i resistant; 20-40% moderately resistant; 40-60% moderately susceptible; >80% susceptible

Table 4. Mean yield of promising F₁ hybrids and their parents

Genotypes	Mean yield, t ha ⁻¹	
	Feb-May '96	July-Oct '96
Surya	17.56	38.26
SM-71	19.70	30.68
SM-116	24.67	2.45
Arka Keshav	16.20	21.20

Data in parentheses indicates percentage increase in yield over the better parent

with glossy appearance. The long fruits of Arka Kesav x SM-71 were deep violet and shining with soft flesh. The salient features of these two hybrids are given in Table 5. The resistance to bacterial wilt in both the parents and hybrids was also confirmed as none of the plants showed any incidence of bacterial wilt during both the seasons.

Considering the over all superiority (Table 5) in terms of yield, attractive fruit quality and resistance to bacterial wilt, resulting in better con-

Table 5. Salient features of promising hybrids and their parents

Genotypes	Fruit colour	Fruit shape	Fruit length, cm	Fruit dia., cm	Fruit wt., g	Fruit yield, t ha ⁻¹	Reaction to bacterial wilt
Surya	Purple	Oval	9.20	4.30	44.50	38.26	Resistant
SM-71	Light purple	Long	12.10	2.10	48.10	30.68	Resistant
SM-116	Light purple	Round	7.85	5.15	106.00	32.45	Resistant
Arka Keshav	Deep purple	Linear	19.50	2.60	69.20	21.20	Resistant
Surya x SM-116	Deep purple	Oval	10.50	5.10	146.00	91.31	Resistant
Arka Keshav x SM-71	Deep purple	Long	20.50	3.10	88.50	89.07	Resistant

sumer acceptability, the two hybrids Surya x SM-116 and Arka Keshav x SM-71 were progressed for testing in farmers fields. Both the hybrids were accepted by the farmers and can be recommended for commercial cultivation in wilt sick soils.

ACKNOWLEDGEMENT

The authors are thankful to the Indian Council of Agricultural Research for providing financial assistance to the scheme.

REFERENCES

Geetha, P.T. and Peter, K.V. 1993. Bacterial wilt resistance in a few selected lines and hybrids of brinjal (*Solanum melongena* L.). *J. Imp. Agric.* 31 : 274-276

Paroda, R.S. and Kalloo, G. *Vegetable Research with Special Reference to Hybrid Technology in the Asia Pacific Region*, FAO, Bangkok, p 144-145

KAU, 1993. *Package of Practices Recommendations - Crops*. Directorate of Extension, Kerala Agricultural University, Trichur, p 176-181

Pal, B.P. and Singh, H.B. 1946. Studies on hybrid vigour in brinjal and bitter gourd. *Indian. J. Genet.* 6 : 19-33

Singh, S.N. 1980. Studies on heterosis and per se performance in brinjal. *Veg. Sci.* 7(1 & 2) : 17-26

Singh, B. and Kumar, N. 1988. Studies on hybrid vigour and combining ability in brinjal (*Solanum melongena* L.). *Veg. Sci.* 15 (1) : 72-78

Varma, S. 1995. Variability and heterosis in green fruited brinjal (*Solanum melongena* L.). M.Sc. (Ag.) thesis, Kerala Agricultural University, Vellanikkara, Trichur