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Evaluation of F_1 Crosses of Brinjal (*Solanum melongena* L.) Landraces for Fruit Yield, Quality and Tolerance to Bacterial Wilt

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Field experiment was carried out at All India Coordinated Research Project on Vegetable Crops, OUAT, Bhubaneswar, Odisha, India in order to identify the superior F_1 crosses for marketable fruit yield quality and resistance to bacterial wilt. All total 21 F_1 crosses evolved from seven distinctly diverse local landraces of brinjal along with a hybrid check, Mahy Green were evaluated by adopting Randomized Block Design and replicated twice in *rabi* 2021-2022. Results revealed

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significant variations among various fruit quality attributes (TSS: 4.32 ^{o}Brix to 6.00 ^{o}Brix and ascorbic acid content of fruit: 5.10 mg100g^{-1} to 7.10 mg100g^{-1}), incidence of bacterial wilt (30 DAT: 0.00% to 4.17%, 60 DAT: 0.00% to 12.50% and 90 DAT: 0.00% to 20.83%). Out of 21 crosses, nine cross showed immune reaction to bacterial wilt at 90 DAT. The marketable fruit yield plant^{-1} varied significantly from 1.00 kg to 1.99 kg. The F_1 cross *viz.* BBSR-08-2 × Selection from BBSR-145-1(1.99 kg) recorded significantly highest fruit yield plant^{-1} followed by BBSR-08-2 × BBSR-10-25(1.87 kg) and BBSR-08-2 × BBSR-10-26 (1.81 kg). Thus, it may be concluded that, F_1 crosses obtained from local landraces of brinjal *viz.,* BBSR-08-2 × Selection from BBSR-145-1, BBSR-08-2 × BBSR-10-25 and BBSR-08-2 × BBSR-10-26 may be recommended for higher marketable fruit yield, fruit quality and over all resistance to bacterial wilt for higher profit. These local landraces may also be used for future brinjal improvement programme towards development varieties with higher fruit yield quality and resistance to bacterial wilt.

Keywords: Brinjal; F_1 crosses; fruit quality; bacterial wilt.

1. INTRODUCTION

Brinjal or eggplant (*Solanum melongena* L. 2n=24) is one of the most cultivated solanaceous fruit vegetable, cultivated predominantly in tropical and sub tropical regions of the world [1]. It is a flexible crop adapted to different agro-climatic regions and can be grown throughout the year. It is an important crop in the tropical regions of world and is being grown commonly in India, China, Turkey, Japan, Italy, Indonesia, Iraq, Syria, Spain and Philipines [2]. Its immature fruits are generally used as vegetable and other culinary preparations, unripe fruit is essentially consumed as cooked vegetable in various forms and the dried shoots are used as firewood in rural areas. Brinjal is consumed by many ways like salad, bhaji, stuffed brinjal, bhartha, pickles etc., has made the brinjal more popular among vegetables in India. Its fruits are widely consumed in various culinary preparations and are rich source of protective nutrients [3]. Brinjal fruits are rich source of minerals like calcium, phosphorus and magnesium along with fatty acids [4]. Brinjal fruits are also known for its medicinal properties in curing diabetic, asthma, cholera, bronchitis, diarrhea, blood cholesterol etc. [5].

Although brinjal is cultivated in different parts of India, the productivity is low as the area is majorly covered by 50.0% of OP/HYV and 32.2% of local types against 17.8% of hybrids [6]. In India, Odisha stands second in brinjal production with the share of 16.34% [7]. Odisha being a major producer, the productivity in the state is very low primarily due to prevalence of local landraces which possess low yield potential but greater resistance towards biotic and abiotic stresses along with better fruit quality.

The brinjal cultivation in the state is acutely affected by various biotic and abiotic stresses. Among the biotic stress, bacterial wilt caused by *Ralstronia solanacearum* (Smith) is the most devastating disease in solanaceous vegetable grown in India including Odisha [8]. In brinjal, the disease limits its production from 4.24 to 86.14 per cent Sabita et al. [9] while in hot and humid climate, it can cause up to as high as 100% losses [10]. Recently, this disease has risen to an alarming proportion in the plains of India including in state of Odisha due to its severity.

Therefore, there is urgency in brinjal crop improvement programme by proper utilization of local landraces through adoption of appropriate breeding method. In other hand there is a need to exploit heterosis for fruit yield quality attributes of local landraces and to incorporate the bacterial wilt resistance or tolerance with wider adaptability in developed varieties. Keeping these facts in view, the present investigation was carried out for identification of F_1 crosses of local landraces of brinjal for fruit yield, quality and tolerance to bacterial wilt.

2. MATERIALS AND METHODS

The present experiment was conducted at All India Coordinated Research Project on Vegetable Crops, OUAT Bhubaneswar, Odisha during *rabi* 2021-2022. Six distinctly divergent local landraces of brinjal *viz*., BBSR-08-02, BBSR-10-25, BBSR-10-26, BBSR-9-6, BSR-195-3 and Selection from BBSR-145-1 and one bacterial wilt susceptible variety, Arka Neelanchal Shyama (ANS) were used in the hybridization programme. The resultant 21 F_1 crosses evolved through half diallel mating (excluding the reciprocals) along with seven parents and one hybrid check Mahy Green of

Mahyco Private Limited, India, were evaluated by adopting RBD and replicated twice for fruit yield and fruit quality and reaction to bacterial wilt disease in *rabi* 2021-2022 . Recommended package of practices were adopted uniformly for raising of the crop. Observations were recorded for fruit yield, fruit quality and percentage of incidence of bacterial wilt at 30 days after transplanting (DAT), 60 DAT and 90 DAT. TSS was determined by digital refractometer and expressed in ^{o}Brix. The ascorbic acid content of brinjal fruit samples were calculated using the volumetric technique [11]. Percentage of disease incidence (PDI) at was calculated as per following the formula [12]:

$$PDI = (Nw/Nt) \times 100,$$

Where,

Nw = number of wilted plants
Nt = total number of plants

The individual germplasm was categorized 0-5 scale based on the PDI value [13].

Scale	(PDI)	Disease Reaction
0	No symptoms	Immune
1	1.00 to 20.00	Highly resistant / HR
2	21.00 to 40.00	Moderately resistant/ MR
3	41.00 to 60.00	Moderately susceptible/ MS
4	61.00 to 80.00	Susceptible/ S
5	> 80.00	Highly susceptible/ HS

The Randomized Block Design was used to statistically evaluate these parameters using analysis of variance (ANOVA).All the observed data were subjected to statistical analysis [14].

3. RESULTS AND DISCUSSION

3.1 Incidence of Bacterial Wilt

Bacterial wilt in brinjal is caused by soil–borne pathogen, *Ralstonia solanacearum* (Smith) which belongs to the family β-proteobacteria, non-spore forming, gram negative and rod shaped bacterium. The wilt infection is characterized by sudden wilting of the foliage followed by collapse of the entire plant. The wilting symptoms include dropping and yellowing of leaves, vascular discolouration [15] and stunted plant growth. Drying of the plants at the time of flowering and fruiting were also observed. A white milky stream of bacterial oozes comes out when the infected cut stem dipped in water was considered is used as the diagnostic symptom for bacterial wilt [16]. The cultural and chemical disease management methods such as soil fumigation, crop rotation, adjustment of planting date and application of chemicals are limited due to its broad distribution, vascular nature, wide host range, great variability and ability to survive in soil and water [17].

In brinjal incidence of bacterial wilt is a serious problems in many parts of world including India. It has been reported that yield loss ranges from 10 to 100% in hot and humid tropical areas with acidic soil [9,18]. Hence, development of new F_1 cross(es) with resistant or tolerance to bacterial wilt definitely increase the yield potential of the genotype.

The data recorded on bacterial wilt incidence at 30 DAT and 60 DAT (Table 1) revealed that, the incidence of bacterial wilt (%) varied from 0.00 to 4.17 and 0.00 to 12.50, respectively. At 30 DAT, all the F_1 crosses exhibited 0.00 or immune reaction to bacterial wilt except BBSR-09-6 × ANS and BBSR-195-3 × ANS (4.17). However, at 60 DAT maximum disease incidence was recorded due to transition from vegetative phase to reproductive phase. At 60 DAT, out of 21 F_1 crosses, 11 crosses exhibited immune reaction to bacterial wilt. Similar reports on peak of bacterial wilt incidence in brinjal was also observed by Antony et al*.* [19].

In the present study, the result showed significant variations towards bacterial wilt at 90 DAT ranging from 0.00 to 20.83 under sick plot conditions. Among the F_1 crosses, the crosses *viz.* BBSR-08-2 × BBSR-10-25, BBSR-08-2 × BBSR-10-26, BBSR-08-2 × BBSR-09-6, BBSR-08-2 × BBSR-195-3, BBSR-10-25 × BBSR-10-26, BBSR-10-25 × BBSR-09-6, BBSR-10-26 × BBSR-195-3, BBSR-10-26 × Selection from BBSR-145-1 and BBSR-195-3 × Selection from BBSR-145-1 showed immune reaction to bacterial wilt, which may be used as parent in future stress breeding programme. Bhubaneswar, Odisha is considered as one of the hot spots for bacterial wilt disease mainly due to hot and humid climate and acidic soil [20], so genotype exhibiting immune reaction under this condition will definitely show resistance or tolerance to bacterial wilt disease in other locations of the country. Similar results were also confirmed by Tripathy et al. [21] under

Table 1. Performance of F_1 crosses for bacterial wilt incidence, marketable fruit yield and unmarketable fruit yield

Sl. No.		% BW incidence at 30 DAT	% BW incidence at 60 DAT	% BW incidence at 90 DAT	Marketable yield plant^{-1} (kg)	Un marketable Yield plant^{-1} (kg)
1	BBSR-08-2 × BBSR-10-25	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.87	0.11
2	BBSR-08-2 × BBSR-10-26	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.81	0.10
3	BBSR-08-2 × BBSR-09-6	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.75	0.13
4	BBSR-08-2 × BBSR-195-3	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.76	0.11
5	BBSR-08-2 × Selection from BBSR-145-1	0.00 (0.71)	0.00 (0.71)	4.17 (1.84)	1.99	0.10
6	BBSR-08-2 × Arka Neelanchal Shyama	0.00 (0.71)	8.33 (2.97)	12.50 (3.55)	1.39	0.13
7	BBSR-10-25 × BBSR-10-26	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.05	0.12
8	BBSR-10-25 × BBSR-09-6	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.29	0.11
9	BBSR-10-25 × BBSR-195-3	0.00 (0.71)	0.00 (0.71)	4.17 (1.84)	1.71	0.10
10	BBSR-10-25 × Selection from BBSR-145-1	0.00 (0.71)	4.17 (1.84)	8.33 (2.97)	1.00	0.13
11	BBSR-10-25 × Arka Neelanchal Shyama	0.00 (0.71)	8.33 (2.97)	12.50 (3.55)	1.19	0.13
12	BBSR-10-26 × BBSR-09-6	0.00 (0.71)	4.17 (1.84)	8.33 (2.97)	1.35	0.15
13	BBSR-10-26 × BBSR-195-3	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.77	0.12
14	BBSR-10-26 × Selection from BBSR-145-1	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.58	0.18
15	BBSR-10-26 × Arka Neelanchal Shyama	0.00 (0.71)	4.17 (1.84)	8.33 (2.97)	1.40	0.14
16	BBSR-09-6 ×BBSR-195-3	0.00 (0.71)	8.33 (2.97)	12.50 (3.55)	1.33	0.20
17	BBSR-09-6 × Selection from BBSR-145-1	0.00 (0.71)	4.17 (1.84)	8.33 (2.97)	1.31	0.14
18	BBSR-09-6 × Arka Neelanchal Shyama	4.17 (1.84)	8.33 (2.97)	12.50 (3.55)	1.34	0.15
19	BBSR-195-3 × Selection from BBSR-145-1	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.37	0.13
20	BBSR-195-3 × Arka Neelanchal Shyama	4.17 (1.84)	12.50 (3.55)	20.84 (4.60)	1.26	0.13
21	Selection from BBSR-145-1 × Arka Neelanchal Shyama	0.00 (0.71)	8.33 (2.97)	16.67 (4.14)	1.24	0.19

Sl. No.		% BW incidence at 30 DAT	% BW incidence at 60 DAT	% BW incidence at 90 DAT	Marketable yield plant^{-1} (kg)	Un marketable Yield plant^{-1} (kg)
22	BBSR-08-2	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.15	0.11
23	BBSR-10-25	0.00 (0.71)	0.00 (0.71)	0.00(0.71)	1.06	0.11
24	BBSR-10-26	0.00 (0.71)	0.00 (0.71)	0.00(0.71)	1.36	0.12
25	BBSR-09-6	0.00 (0.71)	8.33 (2.97)	8.33 (2.97)	1.24	0.15
26	BBSR-195-3	0.00 (0.71)	4.17 (1.84)	4.17 (1.84)	1.57	0.14
27	Selection from BBSR-145-1	0.00 (0.71)	4.17 (1.84)	4.17 (1.84)	1.23	0.17
28	Arka Neelanchal Shyama	12.50 (3.55)	25.00 (5.05)	29.17 (5.43)	1.26	0.12
29	Mahy Green (Check)	0.00 (0.71)	4.17 (1.84)	12.50 (3.55)	1.41	0.15
	GM	0.72 (0.88)	4.02 (1.70)	6.46 (2.16)	1.41	0.13
	SE(m)±	0.32	0.58	0.51	0.06	0.01
	CD (P=05)	0.92	1.67	1.47	0.17	0.04
	CV %	50.46	47.92	33.07	5.82	14.26

**Figures in parenthesis indicates the square root transformed values*

Table 2. Performance of F_1 crosses for fruit quality attributes

Sl. No.		TSS (^{0}Brix)	Ascorbic acid content (mg100g^{-1})
1	BBSR-08-2 × BBSR-10-25	5.50	6.00
2	BBSR-08-2 × BBSR-10-26	6.00	6.21
3	BBSR-08-2 × BBSR-09-6	5.02	6.09
4	BBSR-08-2 × BBSR-195-3	5.19	6.73
5	BBSR-08-2 × Selection from BBSR-145-1	5.01	6.07
6	BBSR-08-2 × Arka Neelanchal Shyama	5.35	6.71
7	BBSR-10-25 × BBSR-10-26	5.24	6.09
8	BBSR-10-25 × BBSR-09-6	5.06	5.71
9	BBSR-10-25 × BBSR-195-3	5.15	5.92
10	BBSR-10-25 × Selection from BBSR-145-1	5.16	6.28
11	BBSR-10-25 × Arka Neelanchal Shyama	5.15	5.94
12	BBSR-10-26 × BBSR-09-6	5.09	6.13
13	BBSR-10-26 × BBSR-195-3	5.30	7.10
14	BBSR-10-26 × Selection from BBSR-145-1	5.35	5.68
15	BBSR-10-26 × Arka Neelanchal Shyama	4.92	5.88
16	BBSR-09-6 ×BBSR-195-3	5.01	5.35
17	BBSR-09-6 × Selection from BBSR-145-1	5.14	5.10
18	BBSR-09-6 × Arka Neelanchal Shyama	4.98	5.96
19	BBSR-195-3 × Selection from BBSR-145-1	4.32	6.13
20	BBSR-195-3 × Arka Neelanchal Shyama	4.73	5.97
21	Selection from BBSR-145-1 × Arka Neelanchal Shyama	5.22	5.75
22	BBSR-08-2	4.43	5.40
23	BBSR-10-25	4.50	5.00
24	BBSR-10-26	4.29	5.23
25	BBSR-09-6	4.19	4.95
26	BBSR-195-3	4.29	5.01
27	Selection from BBSR-145-1	4.55	4.30
28	Arka Neelanchal Shyama	4.91	5.51
29	Mahy Green (Check)	4.51	5.13
	GM	4.95	5.77
	SE(m)±	0.17	0.25
	CD (P=05)	0.48	0.72
	CV %	4.74	6.10

Bhubaneswar conditions. Many of the F_1 crosses showed highly resistance (0.00%) to bacterial wilt because, the cross involving one of the resistant parent contributed to impact high resistance to the disease which was also earlier reported by Khapte et al. [22] and Barik et al. [23] in brinjal. In the F_1 cross BBSR-195-3 × Selection from BBSR-145-1, the resistance to bacterial wilt might be due to requirement of longer incubation period which ultimately suppressed the wilt symptoms at the time of observation recorded. Similar report was also reported by Gopalkrishnan et al. [13]. The local landraces, BBSR-08-2, BBSR-10-25 and BBSR-10-26 were also reported as immune to bacterial wilt under sick plot of AICRP vegetable crops, OUAT, Bhubaneswar [21].

3.2 Fruit Yield

Yield being a complex character affected by various biotic and abiotic factors. In the present investigation, marketable fruit yield refers to the quantity of salable fruit produced excluding the small and borer infested fruits, rotten fruits etc. From economic point of view, in brinjal cultivation, point of view, the producer always interested to grow resistant/ tolerant variety(ies) with higher marketable fruit yield, as only marketable fruit yield will enhance both productivity and profitability. A perusal of data presented in the Table 1 revealed significant variations for marketable fruit yield plant^{-1}. The marketable yield plant^{-1} (kg) varied from 1.00 (BBSR-10-25 × Selection from BBSR-145-1) to 1.99 (BBSR-08-2 × Selection from BBSR-145-1) with a grand mean value of 1.41. Significantly highest fruit yield plant^{-1} (1.99 kg) was recorded by F_1 cross, BBSR-08-2 × Selection from BBSR-145-1 than the rest of the F_1 crosses except BBSR-08-2 × BBSR-10-25 (1.87) where *statistical parity* was observed. Out of 21 F_1 crosses, eight crosses *viz*., BBSR-08-2 × BBSR-10-25, BBSR-08-2 × BBSR-10-26 , BBSR-08-2 × BBSR-09-6, BBSR-08-2 × BBSR-195-3 , BBSR-08-2 × Selection from BBSR-145-1 , BBSR-10-25 × BBSR-195-3, BBSR-10-26 × BBSR-195-3 and BBSR-10-26 × Selection from BBSR-145-1 exhibited higher fruit yield plant^{-1} than the check, Mahy Green (1.41 kg). Similarly, the unmarketable yield plant^{-1} (kg) was highest in BBSR-09-6 × BBSR-195-3 (0.20) as that of minimum in BBSR-08-2 × Selection from BBSR-145-1 and BBSR-08-2 × BBSR-10-26 (0.10). Maurya and Yadav [2] also reported that, the marketable fruit yield plant^{-1} in brinjal F_1 crosses varied from 0.97 kg to 2.13 kg. The results are in agreement with the findings of Nirmala et al. [24] and Bajpai et al. [25].

3.3 Fruit Quality Attributes

TSS (Total Soluble Solids) value affects the taste of the fruit, because it can indicate the level of sweetness of the fruit. TSS is dominated by total sugar content and a small portion of soluble proteins, amino acids and other organic materials [26]. Higher TSS gives the good fruit taste, and consumer preference will be more for such fruits [27]. Observations recorded on TSS revealed significant variations (Table-2). The TSS (^{o}Brix) content of fruit varied from 4.32 (BBSR-195-3 × Selection from BBSR-145-1) to 6.00 (BBSR-08-2 × BBSR-10-26). The maximum TSS content was recorded by the cross BBSR-08-2 × BBSR-10-26 followed by BBSR-08-2 × BBSR-10-25 (5.50), BBSR-08-2 × ANS and BBSR-10-26 × Selection from BBSR-145-1 (5.35). Ealier Tripathy et al. [28] and Koundinya et al. [29] also reported, TSS of brinjal fruit ranged from 3.50 ^{o}Brix to 4.80^{o}Brix and 4.00 ^{o}Brix to 6.8 ^{o}Brix, respectively.

Generally, the higher ascorbic acid content would increase the nutritive value of the fruits, which would help better retention of colour and flavor [30]. Similarly, the ascorbic acid content of fruits (mg100g^{-1}) varied from 5.10 (BBSR-09-6 × Selection from BBSR-145-1) to 7.10 (BBSR-10-26 × BBSR-195-3). The maximum ascorbic acid content was recorded by BBSR-10-26 × BBSR-195-3 closely followed by BBSR-08-2 × BBSR-195-3 (6.73) and BBSR-08-2 × ANS (6.71) where *statistical parity* was observed. Kadivec et al. [31] also reported wide variation for ascorbic acid content in brinjal ranging from 3.36 to 9.27 in brinjal.

4. CONCLUSION

Thus it may be concluded from the present study that, out of 21 F_1 crosses obtained from local landraces of Odisha brinjal, the F_1 crosses *viz*., BBSR-08-2 × BBSR-10-25, BBSR-08-2 × Selection from BBSR-145-1 and BBSR-08-2 × BBSR-10-26 may be recommended for commercial cultivation not only due to resistance to bacterial wilt but also significantly higher marketable fruit yield with relatively superior fruit quality attributes. These local landraces may also be used for future brinjal improvement programme towards development varieties with higher fruit yield quality and resistance to bacterial wilt.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Taher D, Solberg SØ, Prohens J, Chou Y, Rakha M, Wu T. World vegetable center eggplant collection: Origin, composition, seed dissemination and utilization in breeding. Front Plant Sci. 2017; 8:1484.
2. Maurya VK, Yadav GC. Evaluation of the performance of parental line and their F_1 hybrids for yield and quality traits in brinjal (*Solanum melongena* L.), Int J Plant Soil Science. 2022;34(20):2320-7035.
3. Hedges LJ, Lister CE. Nutritional attributes of spinach, silver beet and eggplant. Crop and Food Research Confidential, Report No. 1928;2007.
4. Afful NT, Nyadanu D, Akromah R, Amoatey HM, Annor C, Diawouh RG. Nutritional and antioxidant composition of eggplant accessions in Ghana. Afr Crop Sci J. 2019;27(2):193-211.
5. Sabolu S, Kathiria KB, Mistry CR, Kumar S. Generation mean analysis of fruit quality traits in eggplant (*Solanum melongena* L.). Aus J Crop Sci. 2014;8(2):243.
6. Tripathy B, Tripathy P, Sahu GS, Dash SK, Pradhan B, Sahu P, Nayak NJ, Pradhan P, Sourav S, Mishra S. Evaluation of brinjal (*Solanum melongena* L.) local landraces of Odisha for fruit yield and its components. J Crop and Weed. 2020;16(1):151-154.

7. Area and production of Horticultural crops, 3rd advance estimate 2021-2022, Department of Agriculture and Farmers Welfare, Government of India.
8. Biswal G, Dhal NK. Management of bacterial wilt disease of potato in coastal plains of Odisha. Afr J Microbiol and Res. 2018;12(12):284-289.
9. Sabita JN, Boruah BM, Rachid HA. Yield potentiality of some brinjal cultivars in severely bacterial wilt infected condition. Veg Sci. 2000;27:76-77.
10. Bainsla NK, Singh S, Singh P K, Kumar K, Singh AK, Gautam RK. Genetic behavior of bacterial wilt resistance in brinjal (*Solanum melongena* L.) in tropics of Andaman and Nicobar Island of India. Am J Plant Sci. 2016;7:333-338.
11. Sadasivam S, Balasubramanian T. Practical manual in biochemistry. Tamil Nadu Agricultural University, Coimbatore, India. 1987;14.
12. Namisy A, Chen J, Prohens J, Metwally E, Elmahrouk M, Rekha M. Screening cultivated eggplant and wild relatives for resistance to bacterial wilt (*Ralstonia solanacearum*). Agric. 2019;9(157).
13. Gopalakrishnan C, Singh TH, Artal RB. Evaluation of eggplant accessions for resistance to bacterial wilt caused by *Ralstonia solanacearum* (E.F. Smith). J of Hort Sci. 2014;9:202–205.
14. Gomez KA, Gomez AA. Statistical procedures for agricultural research, 2nd ed., John Wiley and Sons, New York; 1983.
15. Rai PV, Shivappasetty KKA, Vasanthasetty KP. Bacterial wilt of petunia and its source of inoculum. Curr Res. 1975;4:173–174.
16. Ramesh R. Bacterial wilt in brinjal and its management. Technical bulletin 10, ICAR RC For Goa; 2008.
17. Pandiyaraj P, Singh TH, Reddy KM, Sadashiva AT, Gopalakrishnan C, Reddy AC, Pattanaik A, Reddy ADCL. Molecular markers linked to bacterial wilt (*Ralstonia solanacearum*) resistance gene loci in eggplant (*Solanum melongena* L.). Crop Prot. 2019;124.
18. Nishat S, Hamim I, Ibrahim KM. Genetic diversity of the bacterial wilt pathogen *Ralstronia solanacearum* using a RAPD marker. C R Biol. 2015;338:757-67.
19. Antony RS, Gopalasamy G, Senthilkumar M. First report of bacterial wilt caused by *Ralstronia solanacearum* Race I Biovar I in eggplant (*Solanum melongena*) in Tamil Nadu, Southern India. Plant Disease. 2015;99(9):1271.
20. Sarkar S and Chaudhuri S. Bacterial wilt and its management. Curr Sci. 2016;1439-1445.
21. Tripathy B, Tripathy P, Sahu GS, Dash SK, Pradhan BD, Lenka D, Das S. *Per Se* performances of brinjal (*Solanum melongena* L.) F_1 crosses for fruit yield and bacterial wilt tolerance. Pharma Innovation. 2021;10(10):490-494.
22. Khapte PS, Singh TH, Reddy DCL. Screening of elite eggplant (*Solanum melongena*) genotypes for bacterial wilt (*Ralstonia solanacearum*) in field conditions and their genetic association by using SSR markers. Indian J of Agric Sci. 2018;88(10):22-29.
23. Barik S, Ponnam N, Acharya GC, Sandeep V, Singh TH, Kumari M, Srinivas P, Sahu GS. Genetic analysis of bacterial wilt resistance in eggplant (*Solanum melongena* L.). Eur J of Plant Pathol. 2021;160:349-364.
24. Nirmala N, Praneetha S, Manivannan N. 2013. *Per se* performance of cluster bearing, glossy purple Brinjal (*Solanum melongena* L.) hybrids for economic traits. Electron J of Plant Breed. 2013;4(2):1188-1192.
25. Bajpai RK, Mishra DP, Yadav GC, Kumar V, Kumar S. Evaluation of F_1 hybrids and parental lines for quantitative and qualitative traits of brinjal. Int J of Chem Stud. 2020;8(5):768-773.
26. Hadiwijaya Y, Putri IE, Mubarok S, Hamdani JS. Rapid and non-destructive prediction of total soluble solids of guava fruits at various storage periods using handheld near-infrared instrument. In IOP Conference Series: Earth and Environ. Sci. 2020;458(1):12-22.
27. Naveen YKV, Patel AI, Joshi RJ, Chhodavadiya RJ, Moharana SK, Sojitra AM. Genetic studies on fruit yield and its componenets in brinjal (*Solanum melongena* L.). Pharama Innovation. 2022;11(10):1615-1620.
28. Tripathy B, Sharma D, Jangde BP, bairwa PL. Evaluation of brinjal (*Solanum melongena* L.) genotypes for growth and yield characters under Chhattisgarh condition. Pharama Innovation. 2017; 6(10):416-420.
29. Koundinya AVV, Pandit MK, Dolui S, Bhattacharya A, Hegde V. Multivariate

analysis of fruit quality traits in brinjal. Indian J Hort. 2019;76 (1):84-103.

30. Sasikumar A. Screening of eggplant (*Solanum melongena* L.) genotypes for quality and yield. M.Sc., (Hort.) Thesis, Tamil Nadu Agricultural University, Coimbatore; 1999.
31. Kadivec M, Kopjar M, Znidarcic D, Pozrl T. Potential of eggplant peel as by-product. Acta Aliment. 2015;44(1):126-131.

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