Indian Journal of Agricultural Sciences **94** (12): 1328–1333, December 2024/Article
https://doi.org/10.56093/ijas.v94i12.147595

Morphological screening of early segregating generations of brinjal (*Solanum melongena*) for resistance against brinjal shoot and fruit borer

ANKIT KUMAR UPADHYAY[1]*, JIJI JOSEPH[2], ASISH I EDAKKALATHUR[2], BERIN PATHROSE[2] and BEENA C[3]

Kerala Agricultural University, Vellanikkara, Thrissur, Kerala 680 656, India

Received: 19 January 2024; Accepted: 22 October 2024

ABSTRACT

Brinjal (*Solanum melongena* L.), commonly referred as eggplant, represents a globally cultivated vegetable crop highly susceptible to numerous pests and diseases. The brinjal shoot and fruit borer (BSFB) emerges as a particularly detrimental pest, causing potential losses ranging from 70–92%. The absence of effective biological control necessitates extensive research to develop brinjal varieties resistant to BSFB as they will have the potential to furnish an eco-friendly, economically viable, and sustainable strategy for pest management in brinjal cultivation. The present study was carried out during 2022 and 2023 at Kerala Agricultural University, Vellanikkara, Thrissur, Kerala to identify superior lines exhibiting resistance to shoot and fruit borer from early segregating generations (F_3 and F_4) of the cross Ponni × Vengeri which was moderately resistant to BSFB. Both pedigree and single seed descent (SSD) methodologies were employed, revealing considerable variation in qualitative and quantitative traits, encompassing mean, range, and genetic parameters (GCV, PCV, H^2, GA, GAM, skewness, and kurtosis) across successive generations. The persistence of trait variation in the subsequent generation was ensured from the absence of selection during the single-seed descent method. Superior lines, namely 1.2.18.8, 1.2.10.7 and 1.3.10.7 were identified through the pedigree method, while 1.3.11.2, 1.4.13.2 and 1.10.16.4 emerged as superior lines through SSD method, having resistance against BSFB.

Keywords: Brinjal, Brinjal shoot and fruit borer, Genetic parameters, Pedigree, Segregating generation, SSD

Eggplant (*Solanum melongena* L.), is a versatile crop, belonging to the Solanaceae family, and has its origins in Hindustan and China centers, eventually spreading globally. China leads in global production, followed by India. Brinjal contributes significantly to the world's agricultural production, yielding approximately 50 million metric tonnes from over 1.6 million hectares worldwide (FAO 2021). Beyond its culinary appeal, brinjal is a nutritional powerhouse, offering 1.4 g of protein, 124 I.U. of vitamin A, 200 mg of potassium, and 1.3 g of fibre/100 g (Vethamoni and Praneetha 2016). Besides these, fruit extracts are used in treating uterine disorders, skin issues, diabetes, bronchitis, asthma, and cholera. Its diverse applications underscore its cultural and economic importance across the globe.

Significant loss to brinjal crop occurs due to infestation by brinjal shoot and fruit borer (*Leucinodes orbonalis* G.). This insect is identified as one of the most destructive pests, causing potential yield losses of 70–92%, particularly during the summer and rainy seasons (Omprakash and Raju 2014). The larvae bore into shoots during the early stages of crop growth, disrupting the vascular system and causing wilting. If fruits are infested, the larvae bore into the calyx, flower buds, and fruits, resulting in boreholes filled with excrement leading to compromised fruit quality, and unsuitable for human consumption, diminishing market value (Sharma *et al.* 2017). Behera and Singh (2002) have reported various accessions from wild species showing significant levels of resistance against BSFB, viz. indicum, gilo, anomalum, incanum, integriifolium, xanthocarpum, khasianum, and sisymbriifolium.

Among the various breeding approaches, the pedigree selection method is commonly practiced in self-pollinated crops in which genealogies are recorded among the progenies over the segregating generation. Puthiamadom *et al.* (2021) identified cross Ponni × Vengeri as moderately resistant to BSFB with shoot infestation of 15% and fruit infestation of 16% with good organoleptic properties. They classified the cross as moderately resistant as per the scale suggested by Mishra *et al.* (1988). The current study seeks to investigate

[1]The Federal Bank Ltd., Zonal Office, Bengaluru, Karnataka; [2]College of Agriculture, Kerala Agricultural University, Thrissur, Kerala; [3]College of Agriculture, Kerala Agricultural University, Thrissur, Kerala. *Corresponding author email: ankitkumar9133@gmail.com

and select the superior lines with resistance to shoot and fruit borer from early segregating generations of brinjal.

MATERIALS AND METHODS

The present study was carried out during 2022 and 2023 at Kerala Agricultural University, Vellanikkara, Thrissur, Kerala. The experimental materials consisted of 200 F_3 lines from the cross Ponni × Vengeri in the first season (September 2022–May 2023) and 150 F_4 lines in the second season (June 2023–December 2023). Seeds were treated with 1% KNO_3 solution for 1 h to enhance germination. Treated seeds were rinsed with distilled water (Puthiamadom 2021) and sown in protrays. Seedlings, aged 40–45 days, were transplanted in November 2022 and August 2023 for F_3 and F_4 population, respectively, at 90 cm × 60 cm spacing in furrows. The highly susceptible check variety, Surya, was planted on each ridge to ensure fruit borer infestation. Standard cultural and plant protection measures from the Kerala Agricultural University (2016) recommendations were followed during the conduct of experiment. Observations were recorded for fruit colour and shape, the number of branches, flowers, fruits, length of fruit, diameter of fruit, number of infested shoots, number of infested fruits, and fruit yield/plant.

Statistical analysis: The data were analyzed using MS Excel, GRAPES (Gopinath *et al.* 2021), and R-studio. Based on the mean of shoot and fruit infestation throughout the growing season, the lines were categorized as per Mishra *et al.* (1988). The selection was done based on marketable yield/plant, per cent fruit infestation, fruit yield/plant, and per cent shoot infestation. The F_3 population was forwarded in two ways. Lines identified with resistance to BFSB were forwarded as pedigree lines and all lines that produced fruits were forwarded by single-seed descent.

RESULTS AND DISCUSSION

Screening of F_3 population and pedigree selection in cross Ponni × Vengeri

Genetic variability studies for qualitative characters: Ponni, the female parent had green-coloured fruits, while Vengeri exhibited a mix of purple and green fruits. Among the surviving 150 plants, 8 displayed pure purple colour, 97 were green, and 45 had a combination of purple and green. This suggests the dominance of green colour and the influence of polygenes on the expression of fruit colour. Regarding fruit shape, as both Ponni and Vengeri were elongated, all segregating lines produced elongated fruits. Study conducted by Kamani *et al.* (2007), with four crosses with common female parent H7 (purple black) × male parents PLR1 (purple), GBL1 (purple), Green round (green), and Casterious green, out of 240 F_2 lines showed 173:63 purple black: purple, 210:30 purple black: purple, 194:46 purple black: green, and 172:68 purple black: casterious green respectively. Sidhu *et al.* (2022), observed 108 light purple, 39 dark purple, and 53 green fruits in the F_2 population of 200 plants from the cross GL 401 (purple, long) × BR 104 (green, round) indicating the dominance and polygenic effect of purple fruit colour. The study also noted segregation in fruit shapes, as oblong, long, and round shapes. Sharma and Katoch (2023), observed that 119 plants exhibited purple fruit colour, while 9 had green fruit colour, in the F_2 segregating lines of brinjal from the cross Res 2 (long green fruits) × AN (long purple fruits), indicating the dominance of purple. All progenies displayed elongated shapes similar to their parents. These studies suggest that fruit colour in brinjal is influenced by various factors, with effects and segregation patterns varying based on the parents involved. Previous researches by Pugalendhi *et al.* (2010) and Dharavath *et al.* (2017) noted a negative association of purple colour with BFSB infestation, implying that segregating lines with purple fruits may exhibit resistance to BFSB.

Estimation of means and range: The mean, range, and genetic parameters of individual traits in the F_3 generation of cross between Ponni and Vengeri are presented in Table 1. Among the F_3 lines, the number of branches/plant ranged from 1–9, number of flowers/plant from 2–21, number of shoots/plant from 2–22, and the number of fruits/plant from 2–17. For fruit length, the range varied from 6–35 cm, fruit diameter from 4–18.56 cm, average fruit weight from 28.20–99.30 g, and fruit yield 110 g and 1130 g. For the number of infested shoots/plant, the mean value was 2.5, which was higher than both the parents, Ponni (1.5) and Vengeri (1.5). The value ranged from 0–7. The number of infested fruits/plant had a mean of 6.39, which was higher than Ponni (5.00) but, was lesser than Vengeri (7.25). The value ranged from 2–14. The mean and range obtained for the number of infested shoots and fruits were lower than the findings of Kumar and Ravikesavan (2022) and Chaitanya and Reddy (2017). Biometrical traits showed transgressive segregation and were having comparable values with earlier reports in brinjal.

Genetic variability studies for quantitative traits: The values estimated for the genetic variability studies are presented in Table 1. The highest value for σ^2_g, σ^2_p, and σ^2_e was obtained for fruit yield/plant in the segregating lines. The traits with high heritability (H^2) and GAM can be improved through selection and they were number of branches, flowers, shoots, fruits and infested fruits per plant, average fruit weight, fruit yield/plant, and diameter of fruit. The length of the fruit showed high H^2 but medium GAM. The high GA was estimated for fruit yield/plant indicating that selection alone may not be effective to improve fruit yield per plant. All the traits showed the value for skewness greater than 0 and positive indicating average complementary gene action. However, the kurtosis showed leptokurtic peak (>3) for number of flower/plant, shoot infestation, number of fruit/plant, length of fruit, diameter of fruit, and fruit yield/plant indicating that less number of genes are involved in controlling these traits. Platykurtic peak (<3) was shown by number of branches/ plant, number of shoots/plant, fruit infestation, and average fruit weight indicating these traits are controlled by more number of genes, none of the traits showed a mesokurtic peak (0). Even though the skewness and kurtosis can be an indicator of number of genes involved we need to consider other genetic parameters as well to decide the method of breeding to improve the traits. In their study, Patil *et al.* (2021) noted consistent findings regarding the number of branches, flowers, fruits, and yield per plant, showing PCV>GCV alongside high H^2 and GAM values. However, they observed PCV>GCV along with high H^2 and low GAM specifically for fruit length and diameter, while the present study indicated moderate GAM.

Pedigree selection for resistance to BSFB: Fruits in majority of segregating lines were infested with fruit borer. Only three lines, viz. 1.2.18, 1.2.10, and 1.3.10 were identified to be showing less infestation with less number of infested fruits. Under severe shoot and fruit borer infestation, few fruits remain not infested is an indication that the plants are having some level of resistance. Hence, these three lines were forwarded as lines for pedigree breeding to the F_4 generation.

Screening of F_4 population and pedigree selection in cross Ponni × Vengeri

Genetic variability studies for qualitative characters: Among the surviving population of 130, 10 plants showed a distinct purple colour, 54 exhibited a green hue, and 66 plants showcased a combination of both purple and green coloration. This suggests the prevalence of green colour dominance over purple and highlights the contribution of polygenes in determining fruit colour expression. The fruit shape remained long as the parents and F_3 generation.

Estimation of means and range: The mean, range, and genetic parameters of individual traits in the F_4 generation of cross between Ponni and Vengeri are presented in Table 1. Among the lines, number of branches/plant ranged from 1–6, number of flowers/plant from 3–12, number of shoots/plant from 1–14, and number of fruits/plant 1–4. The range for fruit length, was from 4–22 cm, fruit diameter from 2–16 cm, average fruit weight from 18.00–97.50 g, and fruit yield/plant 18 g and 271 g. For the number of infested shoots/plant, the mean value was 0.91, which was lower than the parent, Ponni (1.00) but higher than Vengeri (0.67). The value ranged from 0–4. The number of infested fruits/plant had a mean of 1.43, which was lower than both the parents Ponni (2.33) and Vengeri (2.00). The value ranged from 0–3. Biometrical traits in segregating lines showed transgressive segregation favouring the selection of superior lines. F_3 generation was found to have more range and variability for most of the characters studied. This may be because of non-survival of few plants in F_3 generation resulting in less variability. The mean and range for the number of branches per plant, number of fruits per plant, fruit diameter, and fruit yield per plant were lower compared to the values documented by Chithra *et al.* (2021) in the segregating generation. Conversely, the mean and range for average fruit weight were higher than those reported by them. However, for the length of the fruit, the mean and range values were comparable to their study.

Genetic variability studies for quantitative traits: The values estimated for the genetic variability studies are presented in Table 1. The highest value for σ^2_g, σ^2_p, and σ^2_e was obtained for fruit yield/plant in the segregating lines. The traits with high heritability (H^2) and GAM that can be improved by selection were number of shoots/plant, number of fruits/plant, number of infested fruits/plant, average fruit weight, fruit yield/ plant, length of fruit, and diameter of fruit. The traits number of branches/plant, number of shoots/plant, number of infested shoots/plant, number of fruits/plant, number of infested fruits/plant, and fruit yield/plant showed the value for skewness to be greater than 0 and positive indicating average complementary gene interaction. In contrast, the traits number of flowers/plant, length of fruit, diameter of fruit, and average fruit weight showed negative skewness indicating duplicate gene interaction. However, the kurtosis was found to show a leptokurtic peak (>3) for all the quantitative traits under study indicating the traits to be governed by fewer number of genes, none of the traits showed a mesokurtic peak (0).

Correlation studies in F_3 and F_4 generation: The phenotypic correlation of per-plant yield with quantitative characters are presented in Table 2. In the F_3 generation, the data showed positive correlations between fruit yield/plant with the number of flower/plant, shoots/plant, fruits/plant, infested fruits/plant, length of fruit, and average fruit weight. However, in the F_4 generation, the fruit yield/plant showed a positive correlation with number of branches/plant and diameter of fruit as well which was absent in the previous generation. Between rest of the aforementioned traits and fruit yield/plant, similar correlations (significant and positive) were obtained in both generations. The positive correlation observed between the number of infested fruits/plant and total fruit yield/plant, was because the marketable yield was not considered in this analysis. The study by Kumar and Ravikesavan (2022), in F_2 generation, showed a similar correlation pattern (non-significant) between fruit yield/plant with shoot infestation, fruit infestation, and diameter of fruit. The highly correlated traits with fruit yield like number of branches per plant, number of flowers per plant, number of fruits per plant fruit length, fruit diameter and fruit weight can be considered for indirect selection in segregating lines.

Pedigree data of the plants selected in the F_4 generation: The identified superior lines in the previous generation forwarded through the pedigree method were evaluated and among them, lines 1.2.18.8, 1.2.10.7, and 1.3.10.7 were selected further with the best performance and resistance to BSFB infestation. The lines forwarded through SSD were also evaluated and among them, 1.3.11.2, 1.10.16.4, and 1.4.13.2 were identified to be showing superiority for BSFB resistance. The details of the performance are presented in Table 3. The pedigree selection carried out by Raju *et al.* (2023) from F_4–F_6 generation in brinjal resulted in the selection of superior lines with stable traits in terms of yield and yield contributing traits.

Variability was observed in the F_3 as well as F_4

Table 1 Mean, range and genetic variability parameters for F_3 and F_4 generation of cross Ponni × Vengeri

		NB		NFlP		NSP		NISP		NFrP		NIFrP		FL		FD		AFW		FY	
		F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4	F_3	F_4
Mean		3.92	1.97	9.53	5.32	9.41	3.98	2.50	0.91	6.44	1.69	6.39	1.43	16.24	14.68	10.05	9.08	62.91	56.44	405.65	97.95
Range	Max.	9	6.00	21	12.00	22	14.00	7	4.00	17	4.00	14	3.00	35	22.00	18.5	16.00	99.3	97.50	1130	271.00
	Min.	1	1.00	2	3.00	2	1.00	0	0.00	2	1.00	2	0.00	6	4.00	4	2.00	28.2	18.00	110	18.00
σ^2_p		2.6	0.75	12.05	1.894	14.16	3.837	0.99	0.786	8.77	0.418	8.53	0.484	3.07	13.86	3.07	4.19	203.31	224.48	45799.60	1993.60
σ^2_g		2.3	0.08	10.89	0.23	13.53	2.84	0.66	0.12	6.65	0.25	6.4	0.32	2.08	13.53	2.86	3.90	200.53	221.31	45431.64	1456.27
σ^2_e		0.29	0.67	1.17	1.67	0.62	1.00	0.33	0.67	2.12	0.17	2.12	0.17	0.99	0.33	0.21	0.29	2.78	3.17	367.96	537.33
GCV		38.74	14.77	34.62	8.95	39.09	42.38	32.63	38.11	40.03	29.75	39.63	39.33	8.88	25.06	16.82	21.74	22.5	26.36	52.54	38.96
PCV		41.11	44.08	36.43	25.85	39.98	49.28	39.97	97.78	45.98	38.37	45.74	48.57	10.79	25.37	17.44	22.54	22.67	26.55	52.76	45.58
H^2		88.77	11.23	90.32	12.00	95.59	73.94	66.63	15.19	75.77	60.11	75.10	65.57	67.80	97.60	93.13	93.04	98.63	98.59	99.20	73.05
GA		2.95	0.20	6.47	0.34	7.42	2.99	1.37	0.28	4.63	0.80	4.53	0.94	2.45	7.50	3.37	3.93	29.01	30.47	437.95	67.29
GAM		75.30	10.21	67.88	6.41	78.84	75.17	54.95	30.65	71.89	47.58	70.87	65.70	15.10	51.08	33.50	43.27	46.12	54.00	107.96	68.69
β_1		0.55	1.37	0.99	-0.19	0.32	2.02	0.90	0.95	0.90	0.57	0.77	0.44	0.73	-1.03	0.75	-0.98	0.55	-0.77	1.43	0.43
Int.		+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	-	+	-	+	+
β_2		2.95	6.62	3.44	6.26	2.84	9.64	4.43	4.02	3.43	4.96	2.87	4.9	4.64	4.31	6.04	5.56	2.75	4.31	5.21	3.07
Int.		P	L	L	L	P	L	L	L	L	L	P	L	L	L	L	L	P	L	L	L

NB, Number of branches/plant; NFlP, Number of flowers/plant; NSP, Number of shoots/plant; NISP, Number of infested shoots/plant; NFrP, Number of fruits/plant; NIFrP, Number of infested fruits per plant; FL, Length of fruit; FD, Diameter of fruit; AFW, Average fruit weight; FY, Fruit yield; σ^2_p, Phenotypic variance; σ^2_g, Genotypic variance; σ^2_e, Environmental variance; H^2, Broad sense heritability; GA, Genetic advance; GAM, Genetic advance as percent over mean, β_1, Skewness, β_2, Kurtosis, Int, Interpretation; L, Leptokurtic; P, Platykurtic.

Table 2 Correlation matrix for F_3 and F_4 generation of crops Ponni × Vengeri for biometrical traits

	Generation	NB	NFlP	NSP	NISP	NFrP	NIFrP	FL	FD	AFW
NB	F_3	0								
	F_4	0								
NFlP	F_3	0.11								
	F_4	0.28**								
NSP	F_3	0.43***	0.43***							
	F_4	0.61***	0.40***							
NISP	F_3	0.27***	0.05	0.51***						
	F_4	0.24**	-0.16	0.15						
NFrP	F_3	0.13	0.91***	0.44***	0.05					
	F_4	0.22**	0.68***	0.38***	-0.12					
NIFrP	F_3	0.12	0.90***	0.43***	0.03	0.99***				
	F_4	0.10	0.50***	0.20*	-0.19*	0.81***				
FL	F_3	0.10	0.34***	0.20*	0.07	0.33***	0.32***			
	F_4	0.14	0.50***	0.14	-0.35***	0.40***	0.34***			
FD	F_3	0.10	-0.08	0.05	-0.04	-0.01	-0.04	0.16*		
	F_4	0.26**	0.52***	0.27**	-0.18*	0.50***	0.40***	0.73***		
AFW	F_3	0.08	-0.07	-0.07	0.01	-0.05	-0.06	0.08	0.31***	
	F_4	0.23**	0.45***	0.28**	-0.17	0.47***	0.35***	0.73***	0.76***	
FY	F_3	0.09	0.75***	0.33***	0.05	0.84***	0.84***	0.31***	0.09	0.41***
	F_4	0.22*	0.53***	0.35***	-0.12	0.83***	0.66***	0.52***	0.55***	0.74***

NB, Number of branches/plant; NFlP, Number of flowers/plant; NSP, Number of shoots/plant; NISP, Number of infested shoots/plant; NFrP, Number of fruits/plant; NIFrP, Number of infested fruits per plant; FL, Length of fruit; FD, Diameter of fruit; AFW, Average fruit weight.

Table 3 Performance of selected lines

Lines	SI (%)	FI (%)	FY (kg)	MY (kg)
F_3 selected lines forwarded from F_2 through pedigree				
1.2.18	16.66	50	0.29	0.14
1.2.10	0	71.42	0.50	0.14
1.3.10	22	82.1	0.98	0.17
F_4 selected lines forwarded from F_3 through pedigree				
1.2.18.8	28.57	33.33	0.21	0.14
1.2.10.7	33.33	33.33	0.13	0.13
1.3.10.7	20	33.33	0.15	0.10
F_4 selected lines forwarded from F_3 through SSD				
1.3.11.2	66.66	0.00	0.07	0.07
1.10.16.4	50.00	0.00	0.07	0.07
1.4.13.2	20.00	50.00	0.13	0.06

SI, Shoot infestation; FI, Fruit infestation; FY, Fruit yield; MY, Marketable yield.

generation for fruit colour from pure purple to green and a mixture of purple and green to the parents, i.e. Ponni (green) and Vengeri (mixture of purple and green). All the fruits exhibited elongated shapes as the parents. For quantitative characters, mean and range were higher in the F_3 generation, particularly for the number of branches, flowers, shoots, infested shoots, fruits, infested fruits, and fruit yield/plant. The estimated genetic and phenotypic variances were generally higher in F_3 than F_4, except for length of fruit, diameter of fruit, and average fruit weight, where they were higher in F_4. The lesser difference between PCV and GCV in the F_3 generation indicated lesser environmental influence. However, a greater difference between the PCV and GCV was observed for the number of infested shoots, fruits, infested fruits, and fruit yield/plant indicated greater environmental influence. Heritability (H^2), genetic advance (GA), and genetic advance as a percentage over mean (GAM) showed varied patterns across generations and traits. The study highlights the maintenance of variability from F_3 to F_4 due to the absence of selection in F_3, and the single seed descent method ensured the transfer of all surviving plants to F_4. Fruit yield/plant was positively correlated with most of the quantitative traits under study. Positive correlation between fruit yield/plant with number of branches/plant, flowers/plant, shoots/plant, fruits/plant, length of fruit, diameter of fruit, and average fruit weight indicate that indirect selection of these traits can be considered for yield improvement in brinjal. The better-performing lines forwarded through pedigree were 1.2.18.8, 1.2.10.7, and 1.3.10.7. The lines identified as superior in terms of marketable yield and resistance to BSFB from the F_4 generation through SSD were 1.3.11.2, 1.10.16.4, and 1.4.13.2. These six lines can be forwarded further.

REFERENCES

Behera T K and Singh G. 2002. Studies on resistance to shoot and fruit borer (*Leucinodes orbonalis*) and interspecific hybridization in eggplant. *Indian Journal of Horticulture* **59**(1): 62–66.

Chaitanya V and Reddy K R. 2017. Variability and character association studies in brinjal (*Solanum melongena* L.). *Indian Horticulture Journal* **7**(1): 58–63.

Chithra K, Devaraju M, Srinivasa V, Varalakshmi B and Asha A B. 2021. Genetic investigation in segregating generation of brinjal (*Solanum melongena* L.). *National Academy Science Letters* 2021: 1–4. doi: 10.1007/s40009-021-01070-x

Dharavath S, Sharma R K, Singh J P, Ganesh S and Sinha S R. 2017. Evaluation of brinjal germplasm against major insect pests and predators. *Indian Journal of Entomology* **79**(1): 95–103.

FAO. 2021. World Food and Agriculture-Statistical Yearbook 2021. Food and Agriculture Organization of the United Nations, Rome. Available: https://www.fao.org/documents/card/en/c/cb4477en. 31 Dec. 2023.

Gopinath P P, Parsad R, Joseph B and Adarsh V S. 2021. GrapesAgri1: Collection of shiny apps for data analysis in agriculture. *Journal of Open Source Software* **6**(63): 3437. doi: 10.21105/joss.03437

Kamani J M, Monpara B A and Dhameliya H R. 2007. Inheritance of certain traits in brinjal (*Solanum Melnogena* L.). *National Journal of Plant Improvement* **9**(1): 32–35.

Kerala Agricultural University. 2016. *Package of Practices Recommendations: Crops,* 15^{th} edn, pp. 115. Kerala Agricultural University, Thrissur, Kerala.

Kumar D R and Ravikesavan R. 2022. Genetic variability and correlation analysis in F_2 segregating population in brinjal (*Solanum melongena* L.). *Journal of Applied and Natural Science* **14**(SI): 151–54. doi: 10.31018/jans.v14iSI.3601

Mishra P N, Singh Y V and Nautiyal M C. 1988. Screening of brinjal varieties for resistance to shoot and fruit borer (*Leucinodes orbonalis* Guen.) (Lepidoptera: Pyralidae). *South Indian Horticulture* **36**(4): 188–92.

Omprakash S and Raju S V S. 2014. A brief review on abundance and management of major insect pests of brinjal (*Solanum Melongena* L.). *International Journal of Applied Biology and Pharmaceutical Technology* **5**(1): 228–34.

Patil V, Gangaprasad S and Kumar D. 2021. Studies on variability, heritability, genetic advance and transgressive segregating in brinjal (*Solanum melongena* L.). *The Pharma Innovation Journal* **10**(8): 1763–66.

Pugalendhi L, Veeraragavathatham D, Natarajan S and Praneetha S. 2010. Utilizing wild relative (*Solanum viarum*) as resistant source to shoot and fruit borer in brinjal (*Solanum melongena* Linn.). *Electronic Journal of Plant Breeding* **1**(4): 643–48.

Puthiamadom N, Joseph J, Subramanian M, Pradeepkumar T, Beena C and Latha M. 2021. Defense mechanisms in *Solanum virginianum* against brinjal shoot and fruit borer–A comparative study. *Journal of Tropical Agriculture* **59**(1): 62–70.

Puthiamadom N. 2021. 'Breeding brinjal (*Solanum melongena* L.) for resistance to brinjal shoot and fruit borer', pp. 137. PhD Thesis, Kerala Agricultural University, Thrissur, Kerala.

Raju S S, Jyothi K U, Rao M P, Kumari K U, Krishna B B, Emmanuel N, Rao S N and Veena G A. 2023. Genetic parameters for different characters of the brinjal (*Solanum melongena* L.) in F_4, F_5 and F_6 generation of the cross (EC-169089 × Pennada). *International Journal of Statistics and Applied Mathematics* **8**(6): 787–94.

Sharma A, Rana R S, Sharma K C, Kumar A and Singh S. 2017. Screening of brinjal cultivars resistance against brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee). *International Journal of Entomology Research* **2**(5): 69–75.

Sharma S and Katoch V. 2023. Performance, genetic diversity and inheritance of fruit colour and shape in eggplant (*Solanum melongena* L.). *Genetic Resources and Crop Evolution*, pp. 1–13. doi: 10.1007/s10722-023-01778-3

Sidhu R K, Sidhu M K and Dhatt A S. 2022. Inheritance studies on different quantitative and qualitative fruit traits in brinjal (*Solanum melongena* L.). *Journal of Horticultural Sciences* **17**(2): 298–306.

Vethamoni I and Praneetha S. 2016. Growth and yield attributes with shoot and fruit borer resistance in parents and F_1 hybrids of brinjal. *Madras Agricultural Journal* **103**(1–3): 83–86.